PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

Implementation of the 2004 Integrated Pest Management Plan

For Fort Riley Army Installation, Kansas

United States Department of the Army
Directorate of Environment and Safety
Conservation Division
Fort Riley, Kansas

January 2004

Responsible Agency:

United States Department of the Army
Directorate of Environment and Safety
Conservation Division
Fort Riley, Kansas

Proposed Action:
Implementation of the Integrated Pest Management Plan
For Fort Riley Army Installation, Kansas

Responsible Individual:

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PROGRAMMATIC ENVIRONMENTAL ASSESSMENT OF THE FISCAL YEAR 2004 INTEGRATED PEST MANAGEMENT PLAN FOR FORT RILEY, KANSAS

EXECUTIVE SUMMARY

This Programmatic Environmental Assessment (EA) analyzes potential environmental consequences of the full implementation of Fort Riley's 2004 Integrated Pest Management Plan (IPMP). Full implementation is the proposed action (preferred alternative). The "No Action" Alternative also is considered. This EA analyzes the effects of the two alternatives on land use, natural and cultural resources, human health and safety, the sociological environment and the military mission.

The Department of Defense (DoD), the Department of the Army, and the Fort Riley Army Installation, specifically, are committed to following all applicable environmental regulations while conducting activities under the Fiscal Year 2004 IPMP (October 1, 2003- September 31, 2004). The principles of Integrated Pest Management (IPM) serve as the foundation for all activities described within the IPMP. IPM uses the best mix of available control methods for achieving the most effective, economically and environmentally safe pest management possible.

This EA was conducted in compliance with the National Environmental Policy Act (NEPA), Council on Environmental Quality Regulations, 40 Code of Federal Regulations 1500 et seq., and Chapter 5, Army Regulation 200-2 (*Environmental Effects of Army Actions*). The 2004 IPMP would not be implemented until the NEPA process is completed.

The "Full Implementation" Alternative is an integrated approach with the purpose of supporting the military mission. Full implementation of the IPMP is anticipated to have positive effects to all six major environmental areas: land use, natural resources, cultural resources, human health and safety, sociological environment and military training. This is the preferred alternative.

The "No Action" Alternative is one in which there is no integration among major programs. Pest management would be conducted independently of natural and cultural resources management programs. Nor would there be the emphasis on protecting native biodiversity per DoD guidance. Pest management would still be conducted in support of military training. This alternative is anticipated to produce adverse effects to land use, certain natural resources, human health and safety and certain socioeconomic aspects. Therefore, this alternative is not favored.

PROGRAMMATIC ENVIRONMENTAL ASSESSMENT OF THE FISCAL YEAR 2004 INTEGRATED PEST MANAGEMENT PLAN FOR FORT RILEY, KANSAS

PROGRAMMATIC ENVIRONMENTAL ASSESSMENT OF THE 2004 INTEGRATED PEST MANAGEMENT PLAN FOR FORT RILEY, KANSAS

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

Fort Riley Army Installation is required to develop and implement an Integrated Pest Management Plan (IPMP) pursuant to Army Regulation (AR) 200-5, *Pest Management* and Department of Defense Instruction (DoDI) 4150.7-1, *The DoD Pest Management Program*. The purpose of the 2004 IPMP (October 1, 2003- September 31, 2004) is to provide guidance for operating and maintaining an effective and environmentally safe pest management program.

This Programmatic Environmental Assessment (EA) evaluates the potential environmental impact associated with the implementation of Fort Riley's 2004 IPMP. The environmental aspects evaluated are land use, natural and cultural resources, human health and safety, the sociological environment and the military mission. This EA describes the proposed action, alternatives to the proposed action, and related environmental effect (impact). A systematic, interdisciplinary approach was used to analyze the affected area, to estimate the environmental effect, and to write the EA. The interdisciplinary team consisted of biologists, agronomists, archeologists and an environmental law attorney.

1.1. Scope

1.1.1. Scope of the Environmental Assessment

The scope of this EA is the analysis of the proposed action to implement Fort Riley's 2004 IPMP. Potential effect to land use, natural and cultural resources, human health and safety, the sociological environment and the military mission is analyzed. This EA identifies, documents, and evaluates the effects of the proposed action and one alternative. This EA addresses the geographical area associated with Fort Riley and the areas affected by the proposed action.

This document also provides a comprehensive, programmatic evaluation that is broad enough in scope to assist in the evaluation of future pest management actions. This EA was prepared as a programmatic environmental review to provide a tiering function. This approach minimizes the repetitive analysis of future actions. Fort Riley representatives would use this programmatic EA to evaluate any future change in operational procedures associated with pest management. If it is determined that there is a need for additional environmental documentation, this EA would serve as a primary source document that can be used to reduce the level of effort required to prepare future documents.

This EA substantially integrates information from the June 2002 *Revised Final Programmatic Environmental Assessment of Integrated Approach to Noxious Weed Control Including Aerial Spraying of Herbicides at Fort Riley, Kansa*s; the October 2001 *Final Programmatic Environmental Assessment of Integrated Approach to Noxious Weed Control Including Aerial Spraying of Herbicides at Fort Riley, Kansa*s; and the 2001 EA, *Implementation of Fort Riley's Integrated Natural Resources Management Plan*.

This EA will evaluate, discuss and analyze activities to:

- Identify and consider alternative treatment methods,
- Identify the positive and negative effects of implementing alternative courses of action for the pest management, and
- Identify the cumulative environmental impact of pest management actions.

The installation's pest management program is subject to continuous evaluation and adaptive change as new technologies, equipment, and pests are identified. Therefore, this EA only identifies and evaluates representative control methods. Recognizing the changing nature of populations of pests, their location on the installation, and the evolution of effective treatment methods, this document provides a process that can be used to guide future decisions and determine the level of additional control actions.

This EA does not purport or attempt to provide a quantitative analysis of the site-specific impacts associated with individual projects that would be implemented during the five-year period covered by the 2004 IPMP. Consideration of site-specific impact would be undertaken at a second level of decision-making by Fort Riley Directorate of Environment and Safety (DES) staff. Consistent with the National Environmental Policy Act (NEPA) and other applicable statutes and regulations, they would make an independent determination of the scope and level of additional documentation, if any that may be necessary. This would be completed prior to proceeding with specific projects or training activities that may affect the environment.

1.1.2. Scope of the 2004 IPMP

Fort Riley's 2004 IPMP was prepared to consolidate information formerly distributed among several organizations within Fort Riley. This plan also was designed to formalize roles and responsibilities of the various departments, organizations, and personnel actively involved in the application, storage, and use of pesticides at Fort Riley. The plan is updated and reviewed annually to reflect all changes made in the Pest management program annually during the fiscal year. However, a complete revision is made only every five years.

This plan identifies the existing pests at Fort Riley and characterizes their destructive abilities to ensure that the desired level of protection is achieved.

The scope of the IPMP encompasses:

- The identification of applicable laws, regulations, and military policies;
- Documentation of the history of the program and its current practices;
- Recommendations for future improvements in the program;
- Consolidation of relevant technical information on pest management into a single resource;
- Provision of detailed information concerning pest management operations, safety operations, and the use of pesticides and equipment available for application.

1.2. Issues and Public Concerns

Issues and public concerns were identified during the writing of the 2004 IPMP based DoD and Army guidance and published literature, feedback from stakeholders and interested parties

including military trainers and Command as well as customers, and internal discussions among DES staff.

Environmental concerns pertaining to the protection of stream habitat were identified through discussions with the U.S. Fish and Wildlife Service (USFWS) and the Kansas Department of Wildlife and Parks (KDWP) as a result of coordination on previous environmental assessments pertaining to pesticide use. This long-standing coordination began with a 1993 Environmental Assessment reviewing aerial herbicide spraying of gunnery targets. Also, DES Conservation Division staff coordinated with the USFWS to address concerns identified in the *Revised Final Programmatic Environmental Assessment of Integrated Approach to Noxious Weed Control Including Aerial Spraying of Herbicides*, June 2002, and *Final Programmatic Environmental Assessment of Integrated Approach to Noxious Weed Control Including Aerial Spraying of Herbicides*, October 2001.

The identified issues are:

- Attainment of a 50% reduction in pesticide usage per DoD Policy
- Maintenance of native biodiversity and control of exotic organisms
- Protection of water quality
- Human health and safety
- Full support of the military mission
- Protection of fish and wildlife, including threatened and endangered species

A primary concern identified by the USFWS is the protection of threatened and endangered fish and wildlife. Thus, Section 5.0, *Environmental Consequences*, emphasizes the effect of aerial spraying to control noxious weeds on native biodiversity. Noxious weed control affects an extensive portion of Fort Riley's land base. The potential magnitude of effects warrants in-depth evaluation of effects. In addition to this assessment, two other EAs were completed to address effects of aerial spraying. These were the *Revised Final Programmatic Environmental Assessment of Integrated Approach to Noxious Weed Control Including Aerial Spraying of Herbicides*, (June 2002) and *Final Programmatic Environmental Assessment of Integrated Approach to Noxious Weed Control Including Aerial Spraying of Herbicides* (October 2001). Those programmatic EA provided detailed information on toxicity values and screening criteria.

Another important concern is the control of exotic organisms, particularly sericea lespedeza (sericea), which is a noxious plant species. Sericea poses a substantial threat to native biodiversity and ecosystem integrity. Sericea adversely affects native biodiversity because this plant forms monocultures at the expense of the native plant communities.

1.3. Regulatory Compliance

This EA was prepared in compliance with the NEPA, Council of Environmental Quality (CEQ) Regulations at 40 Code of Federal Regulations (CFR) 1500 et seq., and AR 200-2, *Environmental Effects of Army Actions,* Chapter 5. AR 200-2 has been codified into 32 CFR Part 651. The purpose of this EA is to evaluate positive and adverse environmental impact of full implementation of Fort Riley's 2004 IPMP.

The NEPA of 1969, as amended (Public Law 91-190, 42 United States Code 4321 et. seq.) and implemented by the CEQ regulations was created to prevent or eliminate negative environmental

effects from federal projects and activities during the planning stages through mitigation and/or avoidance. Any action that could have an impact on human health, any natural system (air, water, soil, plant, animal, or other resources), of any social or economic system, upon which there is an expenditure of federal funds, must have some level of environmental analysis to determine the effects.

AR 200-2 establishes policy, procedures, and responsibilities for assessing the environmental effects of Army actions. AR 200-2, implemented by 32 CFR 651, executes the CEQ's NEPA regulations, Executive Order (EO) 12114, DoD Directive 6050.1, and DoD Directive 6050.7. Fort Riley shall operate in compliance with all applicable federal regulations, including but not limited to 32 CFR 651 and 40 CFR 1500-1508, and all pertinent EOs.

Pest management activities, as described in the IPMP, must be properly planned, coordinated, and documented using NEPA. The NEPA process also is used to identify potential impacts to pest management from other installation activities and projects.

1.4. NEPA and this IPMP

Effects of implementation of the 2004 IPMP are being documented in this EA. This EA is to cover the five-year cycle of the IPMP. The 2004 IPMP can be referenced with regard to description of affected environment, including the military mission, to reduce verbiage in this EA and other NEPA documents. The 1998 IPMP was included in the 2001 *Programmatic Environmental Assessment for the Real Property Master Plan*. Components of Fort Riley's pest management program are described in Fort Riley's 2001 Integrated Natural Resources Management Plan (INRMP) and its associated EA (September 2001).

2.0 ALTERNATIVES CONSIDERED

This section consists of five elements:

- A description of the process used to formulate the alternatives.
- A description of the alternatives that were considered but that were eliminated from detailed study.
- A description of each alternative, including the proposed action.
- A comparison of the alternatives.
- The identification of the preferred alternative.

2.1. Process used to Formulate the Alternatives

Feasible and reasonable alternatives were formulated by the interdisciplinary team based on literature reviews, knowledge of accepted standards of natural resources management philosophy, guidance provide by the DoD and the Department of Army (DA) and input from various natural resources management agencies. Public concerns and issues were other factors taken into account in the development of alternatives. Legally viable alternatives were formulated by consideration of many federal and state laws and EOs.

2.2. Alternatives Eliminated from Detailed Study

Other management alternatives were formulated but were eliminated from this EA. These alternatives were eliminated because they were ecologically unsound, or incompatible with requirements to support the military training mission on Fort Riley or legally unacceptable. These other alternatives included, 1) pest management without regard to the effect on military training, 2) pest management without regard to the effect on natural resources, 3) partial implementation of the 2004 IPMP by eliminating nonchemical means of control, and 4) partial implementation of the 2004 IPMP by eliminating chemical means of control.

Pest management without regard to the effects on the military training was eliminated because it is institutionally unrealistic. Fort Riley's primary existence is related to military training. The second alternative, pest management without regard to effects on natural resources is not ecologically sound or legally feasible. The third and fourth alternatives were eliminated because it is not reasonable to employ solely chemical or nonchemical means to control pests.

2.3. Description of Alternatives

2.3.1. Full implementation of the 2004 IPMP

Fort Riley's 2004 IPMP provides guidance for operating and maintaining an effective pest management program. The principles of Integrated Pest Management (IPM) are stressed in the plan, and the information in the plan, along with adherence to the IPM principles, ensure effective control measures. The Installation Pest Management Coordinator (IPMC) with assistance from other installation natural resources managers revises it each year as required by AR 200-5.

Fort Riley's 2004 IPMP identifies applicable laws, regulations, and military policies; documents the history of the program and its current practices; consolidates relevant technical information on pest management into a single resource; and provides detailed information concerning pest management operations, safety operations, and the use of pesticides and equipment available for application.

Fort Riley's 2004 IPMP:

- Consolidates information distributed among several organizations at Fort Riley.
- Formalizes roles and responsibilities of various departments, organizations, and personnel.
- Provides guidance for operating and maintaining an effective pest management program.

The 2004 IPMP is consistent with current military standards and criteria and is designed to be consistent with the mission of the post. Compliance with the plan would ensure that proper regulatory procedures are followed. The plan prescribes pest management priorities, roles and responsibilities of the various departments, organizations, and personnel actively involved in the application, storage, and use of pesticides at Fort Riley. It also identifies the existing pests at Fort Riley and characterizes their destructive abilities.

The Fort Riley 2004 IPMP establishes these pest management priorities:

1. Control of disease vectors and public health pests
2. Prevention of quarantine pests
3. Control of pests of real property
4. Prevention of stored food product pests

5. Control of noxious and invasive plants
6. Control and prevention of ornamental plant and turf pests
7. Control and prevention of undesirable vegetation
8. Control of animal pests
9. Control of forest pests

There are eight integrated programs that conduct pest control and are administered under the IPMP: Agriculture Outlease, installation facilities pest control, noxious weed control, fish and wildlife foodplot and habitat management, forest management, golf course management, and Preventative Medicine and Veterinary Services. The Directorates of Public Works (DPW) and Community Activities (DCA), Preventive Medicine Service within the Medical Activity Command (MEDDAC) and Veterinary Services work with DES for pest control.

Full implementation of the 2004 IPMP would combine three basic core elements. These elements are program administration and management, protection of human health and safety and the environment and regulatory compliance. Functions such as maintenance of morale and welfare (including Quality of Life) of residents are emphasized. Protection of Army property and equipment is another critical function. Protection of the environment and native biodiversity is a third function. This particularly includes noxious weed control and control of exotic plants and animals per EO 11978 (*Exotic Organisms*).

Objectives for pest management emphasize human dimensions but also include a substantial component for maintaining ecosystem integrity and biological functions. Disease vectors, wildlife disease control, and pests related to hygiene are all human related. Control of feral animals and exotic pests primarily maintain ecosystem integrity. The objectives for pest management are:

- Protect human health and safety
- Effectively use IPM techniques to minimize pest resistance and risks to environmental damage from improper pesticide applications
- Protect Army and adjoining private property
- Protect state agricultural interests and the livestock industry
- Protect natural resources, ecosystem integrity, and native bio-diversity.

Pest management at Fort Riley is subject to numerous laws, regulations and guidance documents including: ten Federal laws and regulations, three Kansas State laws, five EOs and Presidential Memorandums, 27 ARs, Military Standards and DoDI, two Memorandums of Understanding (MOU) between Fort Riley and the Kansas Department of Agriculture; and 33 military technical guides and publications. The DoD in general, and the Fort Riley installation specifically, are legally obligated to follow all applicable environmental regulations while conducting activities under this IPMP. A complete list of laws, regulations and other guidance is in Appendix A.

All pest management on Fort Riley incorporates IPM. IPM includes both chemical and nonchemical controls. Mechanical, biological, physical, cultural, and regulatory controls are nonchemical controls. Specific examples applied at Fort Riley are prescribed burning, removal of unwanted trees with chainsaws and cultivation. IPM is an integral part of pest control that identifies a mix of control types as well as surveillance to determine the best control for a pest.

The four basic principles described below are the heart of IPM, and describe the philosophy used at Fort Riley to manage pests. While any one of these methods may solve a pest problem, often several methods are used concurrently, particularly if long-term control is needed.

Mechanical and Physical Control. This control alters the environment in which a pest lives, traps and removes pests where they are not wanted, or excludes pests. Examples of this type control include: eliminating harborage by caulking or filling voids, screening, use of mechanical traps or glue boards, and use of nets and other barriers to prevent entry into buildings.

Cultural Control. Strategies of this method involve manipulating environmental conditions to suppress or eliminate pests. For example, spreading manure from stables onto fields to dry prevents fly breeding. Elimination of food and water for pests through good sanitary practices may prevent pest populations from becoming established or from increasing beyond a certain size.

Biological Control. Predators, parasites or disease organisms are used to control pest populations with this strategy. For example, parasitic wasps may be introduced to kill eggs, larvae or other life stages. Viruses and bacteria may be used which control growth or otherwise kill insects. Sterile flies may be released to lower reproduction of fly populations.

Chemical Control. Chemicals were once considered to be the most effective control available, but pest resistance rendered many pesticides ineffective. The trend in recent years has been to use pesticides that have limited residual action. While this has reduced human exposure and lessened environmental impact, the cost of chemical control has risen due to requirements for more frequent application. The overall cost of using chemicals as a sole means of control can be quite costly when compared with nonchemical control methods because personal protection and special handling and storage requirements are necessary with the use of chemicals.

IPM employs the best mix of available control methods for achieving the most effective, economic, and environmentally safe pest management possible. Pesticides have been used as the primary control historically, but exclusive dependence on them limits their effectiveness and creates additional problems. These problems include increased resistance to pesticides leading to subsequent pest resurgence or the emergence of new pests after their natural enemies or competitors are decimated. Pesticide applications are becoming more expensive due to increasing prices and more stringent safety precautions. The DoD Memorandum of Merit (MoM) #2 targets a 50% reduction in pesticide use by FY00. For these reasons, the Fort Riley IPM program seeks to minimize pesticide use. Chemicals are used only when necessary, and applications are made in an effective and specific manner.

2.3.2. No Action Alternative

The 2004 IPMP would not be used to manage pests on Fort Riley. There would be no long-term, integrated planning or formal, accepted set of objectives and prescriptions for pest management at Fort Riley. There would be no single, consolidated source of information or agreed upon Standard Operating Procedures. Pest management at Fort Riley would continue but there would be no full integration of various program operations associated with DES, DPW, DCA, MEDDAC and Veterinary Services.

IPM would not be a central strategy to pest management. Mechanical, biological and cultural such as prescribed burning would not be integrated for common goals and objectives to maintain

ecosystem integrity in support of the military mission. Pesticides would be used more frequently and in greater amounts.

Fort Riley would continue to comply with all applicable federal, state and local laws and regulations. Pest management would continue in support of the military mission.

3.0 DESCRIPTION OF FORT RILEY

This section describes those attributes of Fort Riley that would not be affected by the proposed action. These are physical attributes such as location, setting, topography, geology and climate.

3.1. Location

Fort Riley is a military defense installation located in Geary, Riley, and Clay counties of northeastern Kansas (Figure 3.1). The installation is approximately 135 miles west of Kansas City and 130 miles north-northeast of Wichita.

3.2. Setting

The general character of the area surrounding Fort Riley is rural with small farm communities. Lands north of Fort Riley support row crop and cereal grain production. Lands to the south are predominantly rangeland. The Republican, Smoky Hill, and Kansas rivers form part of the installation's southern boundary. Milford Lake, a 15,000-acre impoundment of the Republican River, forms part of the installation's west boundary. The installation is adjacent to one larger community to the west (Junction City) and lies near another to the east (Manhattan).

The ecoregional province in which Fort Riley lies is Prairie Parkland (temperate) (Bailey, 1995). Fort Riley's parkland system is maintained primarily by anthropogenic (man-made) influences and, secondarily, by natural factors. The grassland is interspersed by linear communities of woodlands, highly variable in width, that are associated with streams, other woodland plantings, relatively small, man-made water impoundments, and structures. The closer the tributary streams are to the river, the greater their influence on flora and fauna. The flora and fauna in some locations are further influenced by their proximity to Milford Lake.

3.3. Topography and Geology

Fort Riley lies within the Osage Plains section of the Central Lowlands physiographic province. It is bordered by the Great Plains on the west and the Ozark Plateau on the east. Elevations on Fort Riley vary from 1,025 to 1,365 feet above mean sea level. Terrain varies from alluvial bottomlands along the Republican and Kansas rivers on the southern portion of the installation, through the hilly to steep lands in the central and east portions, to the high uplands in the north and west portions.

Fort Riley consists of three types of geological-physiographic area: 1) high upland prairies; 2) alluvial bottomland flood plains; and 3) broken and hilly transition zones. The high upland prairies consist of alternating layers of nearly level to gently dipping Permian limestone and shale. The uplands often contain various shale units that cover the escarpment-forming limestones. The cutting action of streams on the thick shale units has sculpted much of the area into a rolling plateau. Two types of alluvial bottomlands exist at Fort Riley: wide meandering floodplains of major rivers, with associated terraces; and areas created by smaller creeks and

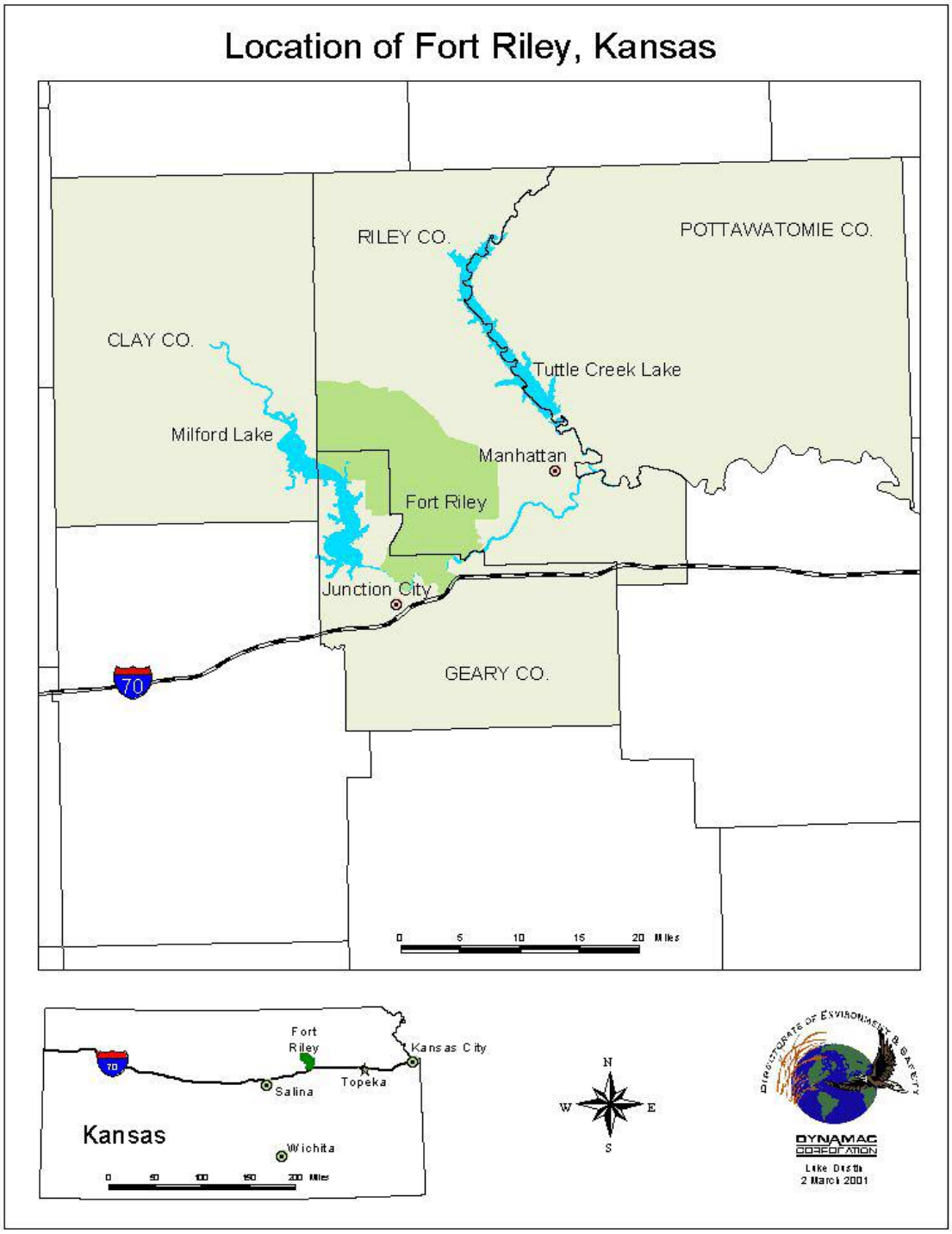
Location of Fort Riley, Kansas
RILEY CO.
POTTAWATOMIE CO.
CLAY CO.
Tuttle Creek Lake
Milford Lake
Manhattan
Fort Riley
Junction City
GEARY CO.
70
0 5 10 15 20 Miles
Fort Riley
Kansas City
Topeka
Salina
Kansas
Wichita
0 50 100 150 200 Miles
N
W
E
S
DYNAMAC CORPORATION
Lake Destin
2 March 2001

Figure 3.1

streams that cut the uplands. The transitional areas, extending from the uplands down to the valley floors are broken, sloping to steep country composed of alternating limestones and shales.

Fort Riley is located within a Zone II seismic area, including the entire Flint Hills area from Oklahoma through east central Kansas to Nebraska. A small fault located northeast of Fort Riley near Tuttle Creek Lake appears to be inactive. Nevertheless, earthquakes producing moderate structural damage are possible within the Fort Riley area. No other identified geologic hazards exist in the Fort Riley area.

3.4. Climate

The description of Fort Riley's climate is taken from the U.S. Department of Agriculture (USDA) and is based on 100-year data. Although these data were published in 1975, they continue to be reflective of the Fort Riley region. Fort Riley has a temperate continental climate characterized by hot summers, cold, dry winters, moderate winds, low humidity, and a pronounced peak in rainfall late in the spring and in the first half of summer. Prevailing winds are from the south to southwest during most of the year. During February and March the prevailing winds are from the north.

Temperatures in the Fort Riley area vary widely and often fluctuate abruptly throughout the year. July and August are the hottest months, averaging 80° F. January is the coldest month averaging 26° F. The average date of the last killing frost in spring is 22 April, and the average date of the first killing frost of the fall is 17 October. The area has an average of 180 frost-free days per year (USDA, 1975).

Average yearly precipitation is 31.64 inches (in.) and most of the precipitation (75%) falls within the six-month period from April through September. The three highest rainfall months (May, June, and July) each average more than 4 in. per month. Much of this precipitation occurs during severe thunderstorms, when 2 in. or more of rain may fall in one storm. December, January, and February are the driest. An average of about 22 in. of snowfall occurs annually (USDA, 1975).

Insufficient precipitation is one of the major limiting factors to plant growth at Fort Riley. Spring rains normally are adequate to recharge soil moisture before the summer months when evapotranspiration rates typically exceed precipitation rates. This is especially the case during the latter half of the summer. Soil moisture in the upper soil levels is depleted, which stresses shallow rooted plants during years of below average rainfall.

4.0 AFFECTED ENVIRONMENT

This section describes the land use, natural and cultural resources, human health, sociological environment and military mission activities at Fort Riley that potentially would be affected by the proposed action to fully implement Fort Riley's 2004 IPMP.

4.1. Natural Resources

4.1.1. Abiotic (Physical) Attributes

4.1.1.1. Land Use

Fort Riley consists of 100,656 acres. Military maneuver and training activities at Fort Riley use 91,621 acres of training and range area or 91 percent of the total installation land area. The training areas and the firing ranges are used extensively throughout the year by soldiers assigned

to Fort Riley as well as active Army units from other installations and U.S. Army Reserve, National Guard, and U.S. Air Force units. Military field training occurs within 100 designated training areas. Seventy-six of these are combined into 17 larger Maneuver Areas north Vinton School Road comprising 70,926 acres. Figure 4.1 shows the Maneuver Areas and the Training Areas.

FORT RILEY MANEUVER AND TRAINING AREAS

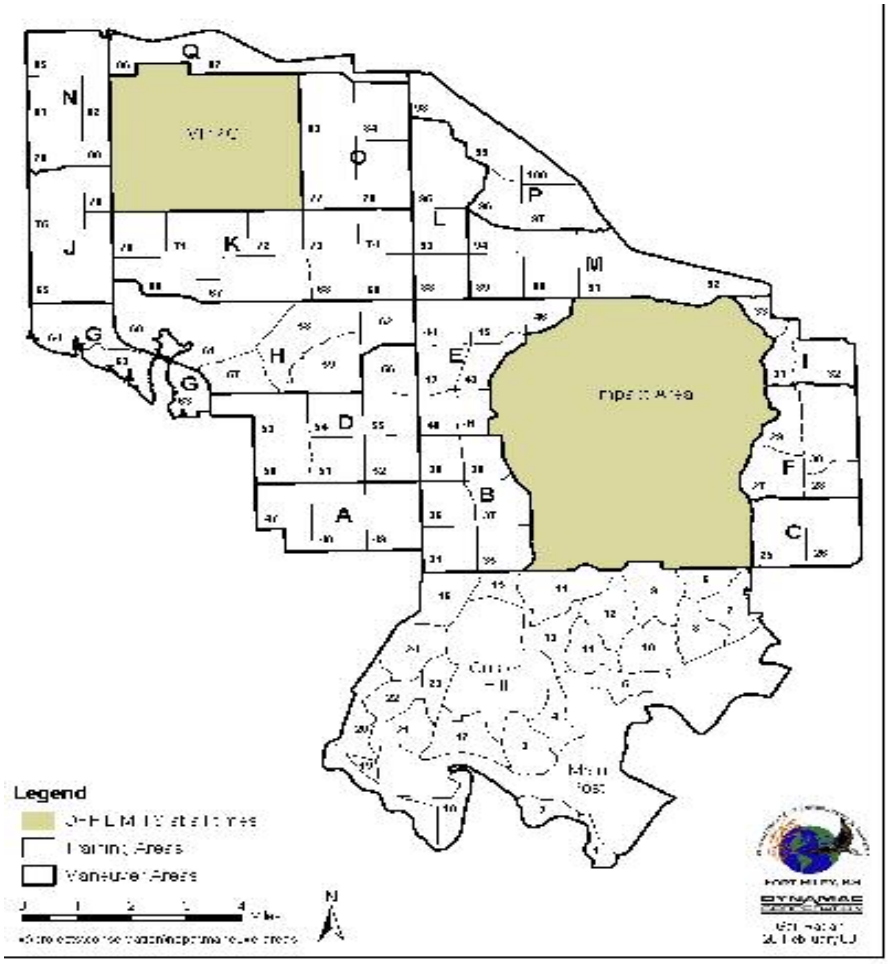

Figure 4.1

4.1.1.2. Soils

Fort Riley is part of the Great Plains Winter Wheat and Range Soil Resource Region. This region is covered with a foot or less of windblown material or loess. The loess rests upon alternating layers of weathered limestone and shale. Most soils are friable, silty loam 6 to 12 inches thick, overlying nearly impervious clays. Fort Riley's soils developed residually from parent materials and from other parent materials carried by water or wind and deposited at the installation. The permeability of installation soils varies from excessively drained sandy lowland soils to tight clays with very slow permeability. Bedrock depths under these soils vary from less than one foot to more than 10 feet.

The USDA Soil Conservation Service (1996) mapped 36 soil series on Fort Riley and taxonomically categorized them into six soil associations. A simplified soil type map of Fort Riley is shown as Figure 4.2.

The Eudora-Haynie-Sarpy and Reading-Kennebec-Ivan soil associations occupy small areas on Fort Riley. The Eudora-Haynie-Sarpy Soil Association is located on the southern boundary of the installation along the Republican and Kansas rivers. These bottomland soils are vegetated by a mixture of trees and grasslands. The Reading-Kennebec-Ivan Soil Association occurs near the northeastern boundary of the installation along Wildcat Creek and its tributaries. These soils are typically forested.

The most abundant soils on Fort Riley are the Wymore-Irwin, Clime-Sogn, Benfield-Florence, and Smolan-Geary associations. These soil associations represent more than 85% of the land area on Fort Riley.

The Wymore-Irwin soils are deep, nearly level to sloping silty clay loams on uplands. They are located along a corridor on either side of old Highway 77 that crosses the installation from south to north and thus receives the bulk of the vehicular traffic associated with the training mission at Fort Riley.

The Clime-Sogn soils are moderately deep to shallow, sloping and moderately steep silty clay loams on uplands. The lack of soil depth and slope position of these soils makes them subject to severe erosion if unprotected. These soils occur prominently in the Impact Area and in Training Areas on the east, south, and west of Custer Hill.

The Benfield-Florence soils are moderately deep, sloping and moderately steep, silty clay loams and cherty silt loams on uplands. Slopes up to 20% make these soils subject to severe erosion if unprotected. These soils are most common on the eastern side of Fort Riley.

The Smolan-Geary soils are deep, gently sloping and sloping silt loams, on high terraces and uplands. These deep loess soils are subject to severe erosion if not protected. All of Maneuver Area C is included in the Smolan-Geary Soil Association.

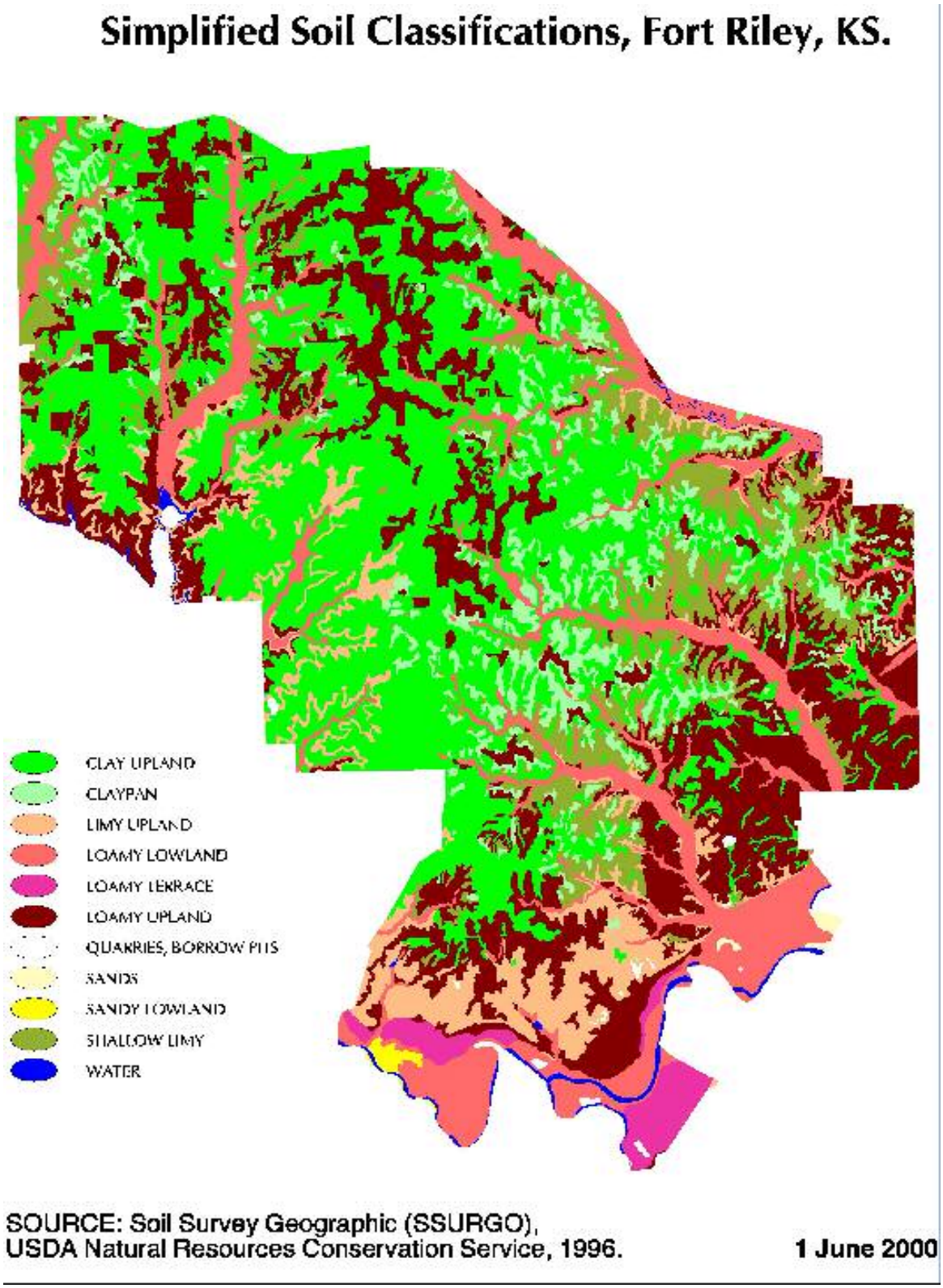
Simplified Soil Classifications, Fort Riley, KS.
CLAY UPLAND
CLAYPAN
LIMY UPLAND
LOAMY LOWLAND
LOAMY TERRACE
LOAMY UPLAND
QUARRIES, BORROW PITS
SANDS
SANDY LOWLAND
SHALLOW LIMY
WATER
SOURCE: Soil Survey Geographic (SSURGO),
USDA Natural Resources Conservation Service, 1996.
1 June 2000

Figure 4.2

4.1.1.3. Water Resources

Waters on Fort Riley are surface water in rivers, other perennial and intermittent streams, ponds and lakes, and ground water aquifers. The Republican and Kansas rivers form the western and southern boundaries of Fort Riley. With the exception of oxbow lakes, the 174 lakes and ponds on Fort Riley are man-made impoundments. Aquifers receive water through alluvial deposits of streams and rivers, porous surface deposits, and fissured limestone in uplands by means of infiltration of rain and seepage from rivers into limestone and shale. Surface waters and nearby off-post waters are shown in Figure 4.3.

Groundwater

Groundwater aquifers occur in the alluvial deposits of the major streams and rivers, in the porous surface deposits, and in the fissured, near-surface limestone of the upland areas. Saturated, water-bearing sediments in the Kansas River Valley range from 0 to 90 feet in thickness. Well yields of 300 to 1,000 gallons per minute are obtained from aquifer thicknesses of 20 to 40 feet, and yields in excess of 1,000 gallons per minute can be obtained where aquifer thicknesses exceed 40 feet.

Moderate quantities of groundwater occur in the bedrock formations of the area, in particular the Fort Riley and Florence limestone formations. Where these limestones are fractured and/or contain solutioned cavities, well yields of 100 gallons per minute or more can be obtained. Wells that penetrate shales in the upland area will generally yield up to several gallons per minute.

Discharge from the valley-fill sediments, the major water-bearing deposits, is by seepage to major streams, evapotranspiration, and withdrawal by wells. Recharge of these deposits is by direct infiltration of precipitation, seepage from streams and ponds, return flow from irrigation, and seepage from the bedrock formations that border and underlie the valley.

Surface Water

Surface waters at Fort Riley are located within the Kansas River Basin and consist of rivers, perennial and intermittent streams, ponds, and lakes. Nearly 145 miles of rivers and streams, consisting of 14 miles of rivers and 131 miles of streams, are present on Fort Riley. All 14 streams are intermittent except for Wildcat, Sevenmile, and Madison creeks. Streams in the southern portion of Fort Riley drain to the south to the Republican or Kansas rivers, which form the installation's southern boundary. Streams in the western portion of Fort Riley drain toward the southwest to Milford Lake on the Republican River. Streams in the northeastern portion of Fort Riley drain to Wildcat Creek, a tributary of the Kansas River.

Wetlands

Wetlands are defined as "those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." (33 CFR Part 328.3 (b); 40 CFR Part 230.41 and Part 230.3).

Wetland areas on Fort Riley include springs and seeps, streams, rivers, ponds and lakes, low areas behind terraces in abandoned crop-fields, and emergent marshes along the periphery of waterbodies, such as those within the Madison Creek and Farnum Creek arms of Milford Lake. The USFWS (1991) documented approximately 1,449 acres of wetlands. Approximately another 84 acres have been constructed since the inventory (total 1,533 acres in 2002). Of this total, 972

acres are considered permanently inundated. Riverine habitat comprises 145 miles and encompasses 748 acres.

FORT RILEY SURFACE WATERS

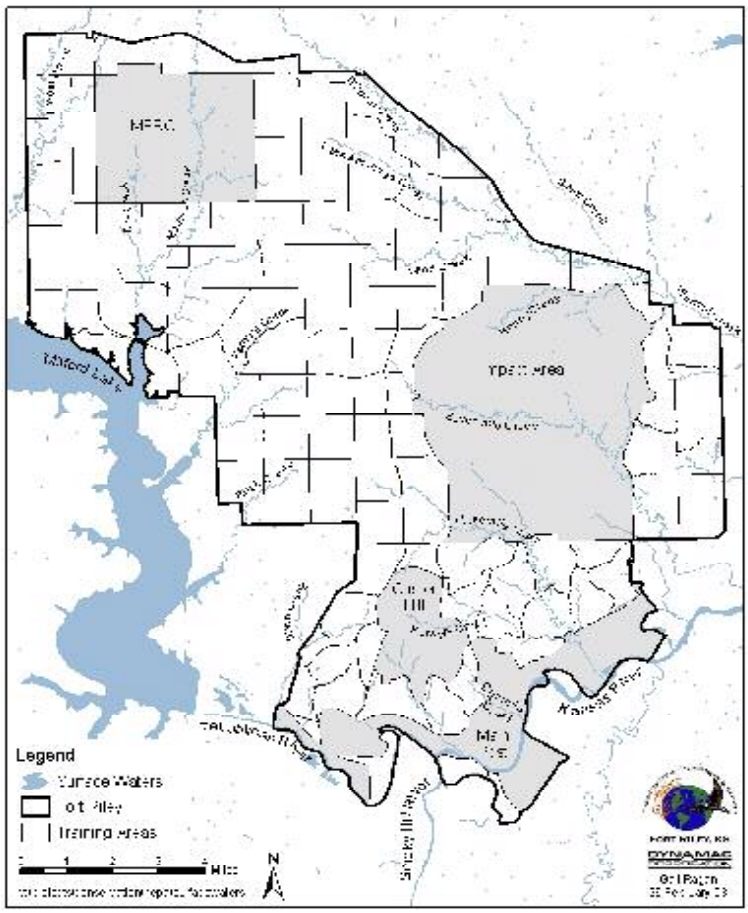

Figure 4.3

4.1.1.4. Air Quality

The National Ambient Air Quality Standards (NAAQS) program was authorized by the U.S. Environmental Protection Agency (EPA) under the Clean Air Act (CAA), as amended in 1990 to assess the quality of ambient air within specific regions of the United States. This provision establishes acceptable concentrations of ozone, carbon monoxide, nitrogen oxides, sulfur dioxide, lead and inhalable particulate matter. National compliance with the NAAQS program by the EPA is evaluated in geographical regions known as Air Quality Control Regions (AQCRs). The Kansas Department of Health and Environment oversees administration of the CAA at the state level and evaluates the air quality in the six AQCRs in Kansas. The region that includes Riley, Geary, and Clay counties is AQCR 96, and it encompasses all of Fort Riley.

The ambient air quality for AQCR 96 is better than the national standards for five of the six criteria pollutants evaluated for this region (lead is not evaluated). Air quality is typically good throughout Fort Riley, and is generally affected only locally by military and civilian vehicle emission, particulate pollution from vehicle traffic along tank trails, fumes from wastewater treatment plants, and construction activities. Mobile sources such as vehicle emissions are generally not regulated and are not covered under existing permitting requirement. Specific occasional emission sources at Fort Riley can include boiler/heater fumes, industrial chemical usage, backup generator exhaust, and petroleum fumes.

4.1.2. Native Biodiversity

DoD and Army Policies are to manage natural resources through an ecosystems approach that emphasizes the maintenance and integrity of native biodiversity. The management of entire flora and faunal communities is the core of ecosystems management. Thus, the EA describes biotic resources in terms of communities. Scientific names are not used in the text of the EA but are listed in appendices.

4.1.2.1. Floral Communities

This region consisted of tall- and mixed-grass prairies dominated by big bluestem, indiangrass, and switchgrass under natural conditions (Kuchler, 1974). The pre-settlement prairie was maintained through periodic wildfires and grazing by herbivores. Woodlands were present within moist bottomlands of floodplains and along perennial stream corridors. However, past and current land management practices, such as the suppression of wildfires, the introduction of agriculture and stock grazing, and the construction and expansion of military facilities, have resulted in the establishment and expansion of several vegetation classes at Fort Riley. Figure 4.4 shows the coverage of four broad categories of land cover type on the installation. These categories are grassland, woodlands and forests, water and urban areas.

As of 2002, 233 plant species from 178 genera and 59 families have been collected and preserved at Fort Riley. The number of plant species identified at Fort Riley is expected to increase as surveying and collection efforts continue. Appendix B is a list of plant species collected on Fort Riley.

Grasslands

Grasslands on Fort Riley comprise about 67% of the installation. Grasslands consist of two basic types: native prairie and “go-back” areas. Areas designated as “go-back” are lands that were once cultivated. “Go back” areas comprise 33% of the grasslands.

FORT RILEY LAND COVER TYPES

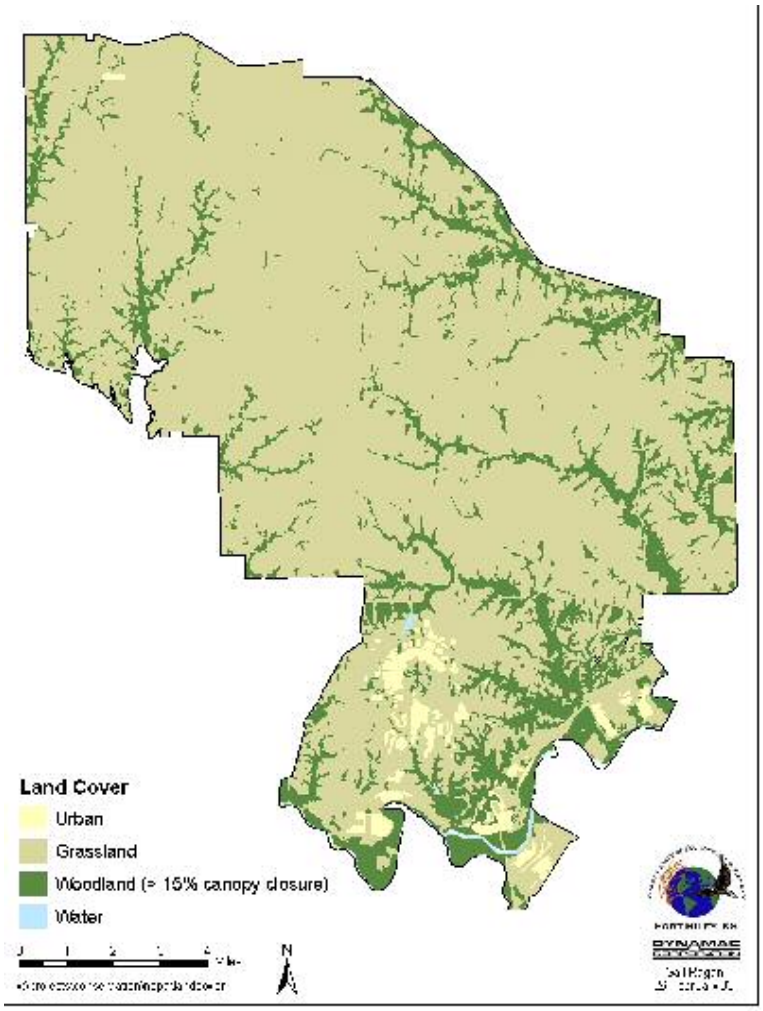

Figure 4.4

The native grasslands of Fort Riley consist primarily of tallgrass prairie. Some elements of the mixed-grass prairie exist because Fort Riley is located near the transition zone between the tallgrass prairie and the mixed-grass prairie to the west (Kuchler, 1974).

The native grasslands on Fort Riley generally do not exhibit dominance patterns of big bluestem, indiangrass, switchgrass, and mid-grasses, such as little bluestem and sideoats grama. Past land use and management, and military training exercises have produced native grasslands intermixed with woody species. Grasses, such as tall dropseed, tall witch grass, and foxtail, increase as a result of disturbance**.** The grasslands with the least soil disturbance contain the highest percentages of native warm-season grasses, such as those mentioned above, and associated forbs. (U.S. Army Corps of Engineers, 1991).

Some of the "go-back" grassland areas on Fort Riley ceased to be cultivated prior to their acquisition by the Army. Most ceased to be cultivated after acquisition. The "go-back" lands are in various stages of ecological succession. Early seral stages consist of annual grasses (prairie threeawn, green bristlegrass, Japanese brome). Forbs (Missouri goldenrod, daisy fleabane, snow-

on-the-mountain, western ragweed) are present in areas that continue to have frequent vehicular traffic (e.g., parts of Maneuver Areas A, D, B and E).

Other "go-back" grassland areas not as frequently or intensively impacted by military vehicles are in slightly further developed seral stages. Dominant species in these areas are those typically occurring in the post's native grasslands or cool season perennial "tame" grasses (mainly smooth brome and lesser amounts of tall fescue) or mosaics of native tallgrass prairie species and perennial cool season "tame" grasses. More than 75% of Maneuver Area O consist of "go-back" and disturbed, but not previously cultivated, grasslands. Also, Maneuver Areas D, H, and K each have more than 2,500 acres of "go-back" land primarily in their eastern portions.

Shrublands

Extensive areas of shrubland are not a historic feature of the prairie environment. The reduction in wildfires and grazing practices employed prior to the installation's acquisition by the Federal. Government, as well as the abandonment of cropfields upon the area's acquisition and subsequent fire suppression efforts, has contributed to the establishment of shrublands on Fort Riley. Nevertheless, shrublands remain a minor component of the installation's landscape, covering no more than 2 to 5 percent of the post.

Shrublands are located along the edges of woodlands, and in isolated patches along the smaller intermittent drainages and ravines, and sheltered areas within grasslands. The vegetation represents a successional stage between grassland and young woodland. The most common species include American plum, rough-leaved dogwood, smooth sumac, buckbrush, eastern red cedar, Arkansas rose, and smaller individuals of hackberry, American elm, and other trees.

Forestlands

Forestlands comprise approximately 16,400 acres of Fort Riley. Most of this acreage is associated with the bottomland forests along the Republican and Kansas Rivers and the woodlands within the drainages of Threemile, Sevenmile and Wildcat creeks. The bottomland forests along the Republican and Kansas rivers have a tall canopy formed by cottonwood, hackberry, green ash, red

mulberry, sycamore, American elm, red elm, bur oak, chinquapin oak, and black walnut. The understory of these woodlands consists of woody shrubs or herbaceous cover.

Forests within higher elevations in smaller stream valleys and ravines are dominated by bur oak and chinquapin oak, American elm, red mulberry, bitternut hickory, black walnut, green ash, and honey locust on the lower slopes with the upper regions of some of these sites producing savanna type vegetation. The understory consists of grasses, forbs, shrubs, and young canopy species with varying densities and dominance patterns. Pole-size stands at higher elevations near the heads of drainages and in isolated patches are dominated by hackberry and American elm mixed with shrubs, forbs, and grasses. Upland forests are more extensive in the north and east aspects than in the south or west.

Twenty-eight tree species have been recorded on Fort Riley. A Forest Inventory conducted 1997-1998 showed the most common species were (in descending order) American elm (21.6%), hackberry (19.4%), and chinquapin oak (9.1%). The median forest tree was eleven inches Diameter at Breast Height (DBH) and was just less than 40 feet tall and about 40 years old. Most stands had a considerable number of pole size trees and were relatively young; only five of the 292 trees aged were more than 100 years old. Twenty percent of the trees were saleable, but they fell predominantly in the 16-20 inch DBH class. A significant portion (7.4%) of the standing trees in forest plots were snags, and nearly a quarter of the post's woodlands had excessive basal area (over 100 square feet per acre), which would require some form of thinning to maintain forest health.

Most areas contain mixed species, but some have primarily chinquapin oak or hackberry. The most common species of woody regeneration are American elm (24%) and hackberry (18%). Species composition is, however, generally shifting from an oak and hickory composition to nearly pure stands of hackberry. Although the regenerating hackberry is less abundant than American elm, hackberry is generally present in larger size classes than elm. The primary factor for the species change is lack of disturbance in forest stands. This allows shade tolerant hackberry to rise from understory to codominance.

The most common non-tree plants in the understory are rough-leaved dogwood (19%), Virginia creeper (12%), buckbrush (9%), and poison ivy (8%), and the average height of understory plants is just over three feet. Approximately one percent of the understory vegetation in woodland plots is listed by Kansas as a noxious weed, the principal one being sericea.

Most stands (83%) have minimal fuel-loading levels. The remaining stands have a moderate fuel loading level (fuels would burn from 1-10 hours).

Savannas

Fort Riley's ecosystem has natural components that are very like those in savannas, which are often considered ecotones between forests and grasslands. Savannas are areas that have tree canopy coverage from 5-15%, are 1 acre or more in size, have associations with typical prairie vegetation and have canopies that are typical of open-grown trees. Savanna vegetation composition and density are mainly determined by fire. Consequently, the pattern and extent of present savannas depend on recent fire histories and the land's geomorphology. Most sites on Fort Riley meeting the above criteria for a savanna are in Maneuver Areas A, D, J, and N. The total area of savanna sites on Fort Riley is approximately 450 acres.

A survey of Fort Riley's savannas was completed in 1999, and it showed more than one-fourth of the plots surveyed have significant visible fire indicators on the trees. Fort Riley's savannas have an average of 25 trees per acre. Thirteen tree species were recorded. The most common are hackberry (33%), American elm (22%) and green ash (12%). Sixty-two species of understory plants exist in Fort Riley's savannas; the most common are smooth bromegrass (37%), big bluestem (12%), Japanese bromegrass (5%), and little bluestem grass (5%). Notably, noxious weeds are very rare on the savanna sites (0.1%).

Croplands

Croplands are a minor component of the Fort Riley ecosystem but are important to wildlife. Approximately 1,600 acres are located along much of east, north, and west boundaries and are leased to local farmers. Approximately 500 additional acres of croplands serve as wildlife foodplots throughout the installation.

4.1.2.2. Faunal Communities

Fort Riley habitat supports at least 43 species of mammals, 223 species of birds, 41 species of reptiles and amphibians, and 50 species of fish (U.S. Army, DES, 2001; Pitts et al., 1987; U.S. Army Corps of Engineers, 1991; U.S. Fish & Wildlife Service, February 1992; Busby, et al 1994, Quist, 1999). Many of these species are year-round residents although most of the birds are seasonal migrants. Species lists are in Appendix C.

Game Animals and Furbearers

Fort Riley supports viable populations of all the typical game species found in this region of Kansas as well the only huntable elk population in the state (1998 – 2001). Upland game birds include bobwhite quail, ring-necked pheasant (the only exotic terrestrial game species on Fort Riley), prairie-chicken, mourning dove, and woodcock. Also, a variety of ducks are common. Fox squirrels and cottontail rabbits are common; gray squirrels are uncommon; and jackrabbits are rarely seen. Those species, which the state defines as "big game" on Fort Riley, are white-tailed deer, mule deer (rarely present), elk, and turkey. Furbearer species are badger, bobcat, mink, muskrat, opossum, raccoon, red fox, gray fox, striped skunk, coyote, and beaver. Principle game species and furbearers are described below.

Non-Game Animals

Twenty-four species of non-game mammals have been documented to occur on Fort Riley. Numerous inventories of birds have been conducted on Fort Riley, resulting in the observation of 223 species, many of which are neotropical migrants. Forty-one species of reptiles and amphibians (18 species of snakes, 6 lizards, 7 turtles, and 10 amphibians) have been observed on Fort Riley. The most common species are the ringneck snake and the western chorus frog.

Numerous inventories conducted have documented 60 species of fish in Fort Riley's streams, lakes, and ponds. Thirty-six species have been found in the Kansas, Smokey Hill and Republican rivers. Fish assemblages in ponds and lakes are largely represented by species managed for recreational fishing. Inventories of aquatic insects and mussels have been conducted in Fort Riley's perennial streams. Nineteen orders/families of aquatic insects and evidence of 17 species of mussels have been documented. Seven of these mussel species were found extant. The other 10 mussel species have apparently been extirpated from the installation.

Threatened and Endangered or Rare Species

Numerous systematic surveys since 1990 have documented the presence of thirteen federally and/or state-listed threatened and endangered (T&E) species, and 23 rare species (Table 4.1). Nine other listed or rare species have never been observed but could possibly occur on Fort Riley. Rare species are those designated by the USFWS as "Species of Concern" (SOC) or the KDWP as "Species in Need of Conservation" (SINC). These designations confer no legal protection under the Endangered Species Act or the Kansas Nongame and Endangered Species Conservation Act.

Plant Species

The only plant species federally listed as threatened or endangered that possibly may exist on Fort Riley is the western prairie fringed orchid. However, it has not been found despite systematic surveys.

Animal Species

Four animals found on Fort Riley are federally and state-listed species. Three are birds: the bald eagle, least tern, and piping plover, none of which are year-around residents. The bald eagle winters on Fort Riley, and the other two species are uncommon migratory transients. All species generally use the major rivers and reservoir areas around the periphery of the post.

The Topeka shiner, a small fish, is the fourth species and the only federally listed species on Fort Riley year-round (Quist, 1999). It is found in Wildcat, Sevenmile, Wind, and Little Arkansas creeks, all of which are streams on the east side of the installation. It has not been found in other Fort Riley streams despite systematic surveys.

Twenty-three animal species considered rare are present on Fort Riley. Most of these are birds, five are reptiles or amphibians, three are riverine fish, two are insects, and one is a mammal. Details pertaining to the management of the four federally listed and a recently delisted species (peregrine falcon) present on Fort Riley are contained in the installation's Endangered Species Management Plan (U.S. Army DES, 2001).

Listed Habitats

There is no federal threatened and endangered species critical habitat on Fort Riley. However, the state has designated critical habitat on post for five species: bald eagle, piping plover, least tern, sturgeon chub and Topeka shiner. All lands and waters within five air miles of public lands around Milford and Tuttle Creek reservoirs are listed by the state as bald eagle critical habitat. In additions, all water and lands within a 100-yard corridor along the main stem of the Kansas, Republican and Smokey Hill rivers from the rivers' normal high watermark are listed. All waters within the corridor along the main stem of the Kansas River have been listed as state-designated critical habitat for the least tern and piping plover. State-designated critical habitat for the sturgeon chub is the main stem of the Kansas River from its confluence with the Republican and the Smoky Hill rivers to its confluence with the Missouri River. Stretches along Wildcat, Little Arkansas, and Sevenmile creeks are state-designated critical habitat for the Topeka shiner.

TABLE 4.1 Federally- and state-listed species and other rare species that could occur on Fort Riley.

Species	Federal	State	Possibility on Fort Riley
Baird's sparrow, *Ammodramus bairdii*	SOC		Possible
Bald eagle, *Haliaeetus leucocephalus*	T	T	Winter resident – possible nesting
Bobolink,		SINC	Migrant
Black rail, *Laterallus jamaicensis*	SOC	SINC	Migrant
Black tern, *Chlidonias niger*	SOC	SINC	Migrant
Eskimo curlew, *Numenius borealis*	E	E	Possible
Ferruginous hawk, *Buteo regalis*	SOC	SINC	Migrant - possible winter resident
Golden eagle, *Aquila chrysaetos*		SINC	Transient
Henslow's sparrow, *Ammodramus henslowii*	SOC	SINC	Summer resident
Least tern, *Sterna antillarum*	E	E	Migrant – possible nesting
Loggerhead shrike, *Lanius ludovicianus*	SOC		Resident
Northern goshawk, *Accipiter gentiles*	SOC		Transient
Peregrine falcon, *Falco peregrinus*		E	Migrant
Piping plover, *Charadrius melodus*	T	T	Migrant – possible nesting
Red-shouldered hawk, *Buteo lineatus*		SINC	Transient
Short-eared owl, *Asio flammeus*		SINC	Possible
Snowy plover, *Charadrius alexandrinus*		T	Migrant
Western burrowing owl, *Athene cunicularia*	SOC		Migrant
Whip-poor-will, *Caprimulgus vociferous*		SINC	Summer resident
White-faced ibis, *Plegadis chihi*	SOC	T	Migrant – possible nesting
Whooping crane, *Grus Americana*	E	E	Possible
Southern bog lemming, *Synaptomys cooperi*		SINC	Resident
Eastern spotted skunk, *Spilogale putorius*		T	Possible
Eastern hognose snake, *Heterodon platirhinos*	SOC	SINC	Possible
Timber rattlesnake, *Crotalus horridus*		SINC	Possible
Western hognose snake, *Heterodon nasicus*		SINC	Resident
False map turtle, *Graptemys pseudogeographica*	SOC		Resident
Texas horned lizard, *Phrynosoma cornutum*	SOC		Resident
Blue sucker, *Cycleptus elogatus*	SOC	SINC	Resident
Paddlefish, *Polyodon spatula*	SOC		Possible
Plains minnow, *Hybognathus placitus*	SOC	SINC	Confirmed
Sturgeon chub, *Macrhybopsis gelida*	SOC	T	Possible
Topeka shiner, *Notropis Topeka*	E	T	Resident
American burying beetle, *Nicrophorus americanus*	E	E	Possible
Prairie mole cricket, *Gryllotalpa major*	SOC	SINC	Resident
Regal fritillary butterfly, *Speyeria idalia*	SOC		Resident
Western prairie fringed orchid, *Platanthera praeclara*	T	NA	Possible

E	=	Endangered, In danger of extinction throughout all or a significant portion of its range.
T	=	Threatened, Likely to become endangered within the foreseeable future.
P	=	Proposed, Proposal to be listed as either endangered or threatened published in Federal Register.
SOC	=	Species of Concern, Require additional information to determine if listing is warranted.
SINC	=	Species in Need of Conservation, Questionable ability to be self-sustaining species in Kansas.
Possible	=	Habitat is present and species range overlaps the area but the species is not documented on FRK.

4.1.3. Pest Species

A pest species can be any unwanted plant or animal in any given situation. However, certain categories of pests and species are controlled routinely on Fort Riley. Fort Riley's IPMP describes 12 categories of pests, general control methods used, and the potential damage associated with each pest type. Appendices in the IPMP list these pests and their scientific names by categories.

Many pests negatively affect human health, welfare and morale. Medically important arthropods such as mosquitoes, flies, fleas, ticks, mites and lice infect humans directly or indirectly with the organisms of many dangerous and debilitating diseases. These disease vectors also can infect livestock and pets and thus are economically damaging. General household and nuisance pests are cockroaches, ants, spiders, silverfish, fleas, bees, yellow jackets and other occasional invaders. Stored products pests occasionally infest stored products, particularly products made with flour and rice. Total eradication of these pests is not feasible.

Other pests destroy Army property. Structural pests are subterranean termites, powder post beetles, carpenter ants and bees. Pests of ornamentals and turf include scale insects, elm leaf beetles, bagworms, tent caterpillars, cankerworms, and a host of others. Ornamental tree and shrub pests on Fort Riley that affect junipers, pines and other evergreens include bagworms, tent caterpillars, aphids, scales, mites, pine sawyers, pine wilt nematode, and cedar-apple rust. Elm leaf beetles, hackberry caterpillars, and cankerworm defoliate deciduous trees such as elms and hackberry. Locust and walnut caterpillar also defoliate walnut trees. The American and European elm bark beetles are the vectors for Dutch elm disease. Pests that affect forest resources include walnut caterpillars, hackberry caterpillars, elm bark beetles, European elm bark beetles, eastern tent caterpillars, spring cankerworms, Dutch elm disease and weedy vegetation.

Nuisance animals such as rodents and birds also destroy Army property. Rodents damage property such as wiring of military equipment. Rodents also are important not only because of the many diseases they carry, but also because of the huge amounts of food they eat or contaminate each year. The USFWS estimates that rats alone destroy all the food annually produced by 200,000 farmers in the United States. Some rodent-associated diseases affecting humans are plague, murine typhus, leptospirosis, rickettsialpox and hantavirus.

When bird flocks inhabit structures, they become a noise nuisance, cause fecal contamination of walkways, roads, or vehicles, and become a source of disease for persons living and working around them. Birds also harbor ectoparasites such as fleas, mites, ticks, and lice that bite people. Parasites and many other pests common to bird nests routinely enter buildings and annoy people. Likewise, in aircraft hangers and maintenance areas, bird droppings quickly corrode engine

parts, electronic equipment, and airframe surfaces. Semi-annual bird migrations also affect flying safety.

Other pests negatively affect ecosystem integrity or natural resources values. Aquatic pests include weedy aquatic vegetation, green sunfish, black bullheads and various rough fish. Twenty-nine ponds and lakes within the post are managed to support recreational fishing interests. Rangeland pests include any undesirable, invasive exotic grass, herbaceous, or woody plant species.

The noxious weeds found on Fort Riley hay leases are sericea, musk thistle, field bindweed, and Johnsongrass. Sericea is widespread through many hay leases. Ground and aerial surveys over the last four years show this weed is dramatically expanding its infestation of the installation. Approximately 32,000 acres have been identified as having some level of infestation at the beginning of FY02 (Figure 4.5). No effective biological control exists in the United States at this time.

Though musk thistle was a serious problem as little as ten years ago, population levels of this weed are mostly controlled. Much work was performed in the early to middle 1990's using biological controls to reduce this weed. The thistle head weevil and thistle rosette weevil have significantly reduced musk thistle throughout the installation. Field bindweed is principally a problem on cropland. High visibility areas of the post receive some chemical treatment. Johnsongrass is not a widespread problem throughout the installation. Principally, the weed is associated with areas along the Kansas and Republican Rivers and in spotted areas along the railroad. Nuisance wild animal control is practiced on Fort Riley. Feral cats and dogs are sometimes a problem on the cantonment areas but rarely in the training areas. Feral swine have been and may still be in the training areas. Feral swine have been vigorously controlled on Fort Riley since their discovery in 1993. Other animals that occasionally interfere with post operations include skunks, coyotes, foxes, squirrels, raccoons, opossums, moles and gophers.

4.2. Cultural Resources

Cultural resources are any prehistoric or historic district, site, building, structure, or object significant in American history, architecture, archeology, engineering, or culture that is included in or potentially eligible for inclusion in the National Register of Historic Places (NRHP). This would include artifacts, records, and material remains related to such a property or resource.

Fort Riley is responsible for identifying and protecting significant archeological and architectural resources in compliance with the National Historic Preservation Act (NHPA) of 1966, as amended, and the Archaeological Resources Protection Act (ARPA) of 1979. A number of cultural resource surveys inventorying and documenting archeological and architectural resources have been conducted on the Fort Riley installation.

Fort Riley's Main Post area was listed as a National Register Historic District on the NRHP in 1974. Nearly 300 historic buildings and structures are present in the district. These include officer and enlisted soldiers quarters, barracks, historic hospitals, stables, headquarters, supply buildings, garages and pump houses. There are also 102 archeological sites identified within the Main Post Historic District (MPHD). The first Territorial Capitol Building of Kansas is located near the Kansas River on Fort Riley and is independently listed on the NRHP. The locations of 222 prehistoric, 560 historic and 15 multi-component (prehistoric/historic combination) sites have been identified on Fort Riley outside of the MPHD.

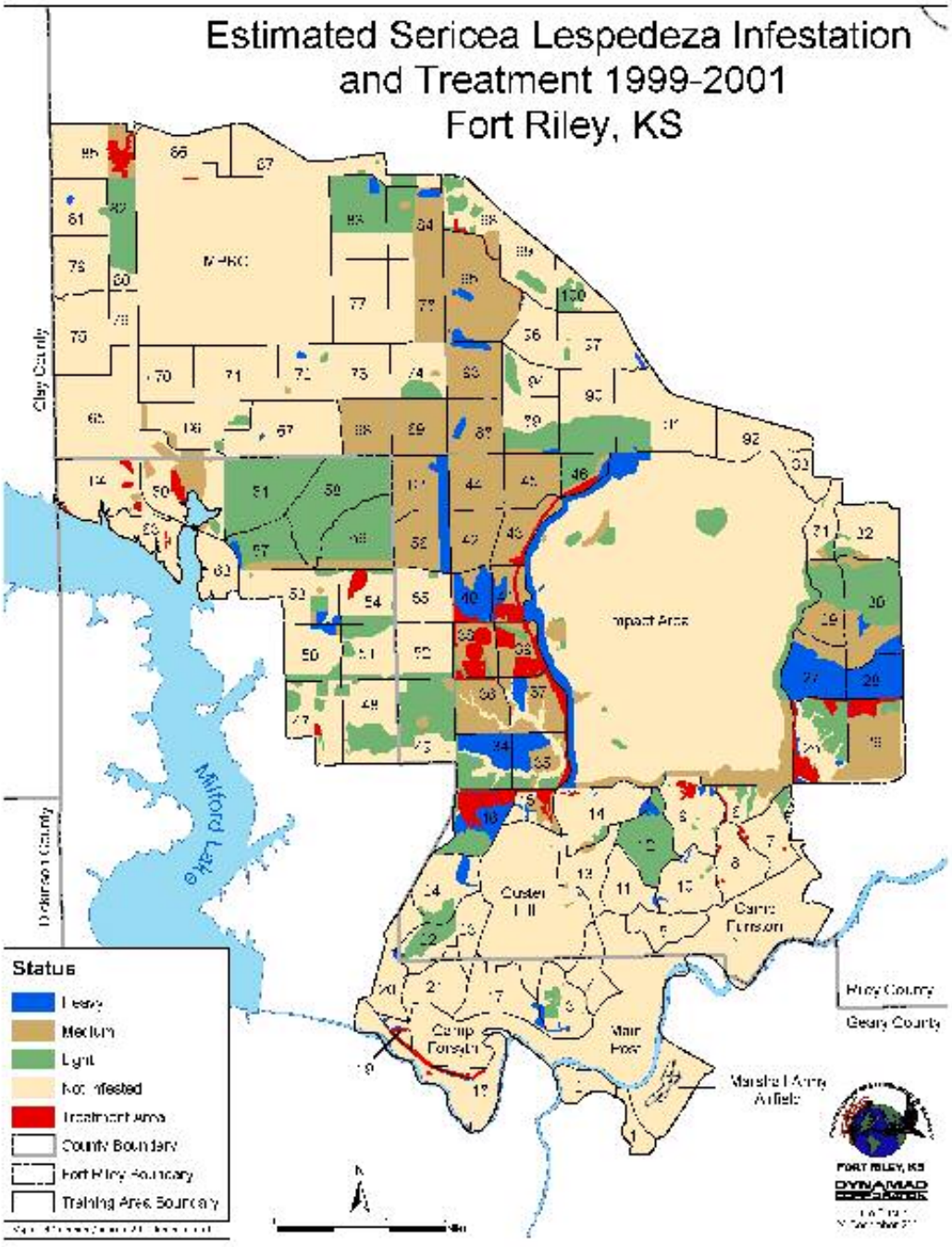
Estimated Sericea Lespedeza Infestation
and Treatment 1999-2001
Fort Riley, KS
Clay County
Dickinson County
Milford Lake
Custer Hill
Camp Funston
Camp Forsyth
Main Post
Marshall Army Airfield
Riley County
Geary County
Status
Heavy
Medium
Light
Not Infested
Treatment Area
County Boundary
Fort Riley Boundary
Training Area Boundary
FORT RILEY, KS
DYNAMAC

Figure 4.5

A Programmatic Agreement (PA) among the DA, Fort Riley, the Kansas State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (ACHP) states that activities at the installation must consider the effects on historic properties included in or potentially eligible for inclusion in the NRHP (U.S. Army DES, 1997). The PA ties together the more specific management practices and activities that the installation had been accomplishing under several individual management plans and agreements. These other plans and agreements included the following:

- The installation's Integrated Cultural Resources Management Plan (ICRMP), which provides a programmatic basis and guidance for the management and preservation of cultural resources in accordance with the Archeological Collections Management Recommendations (CERL, 1996).
- The Historic Landscape Inventory for the Main Post and Fort Riley, Kansas (CERL, 1995), which provides the installation with a brief analysis regarding the evaluation of eleven landscapes on Main Post and vicinity relating to the NHPA.
- The Historical and Architectural Documentation Report (CERL, 1993), which was produced to assist in the effective management of historic structures present at Fort Riley. The report includes: the Historic American Buildings Survey Level IV inventory results; an historical overview of Fort Riley; recommendations for the establishment of NRHP districts and thematic groups within the districts at Fort Riley; and a management overview of the recommendations made.

Phase I archeological and architectural surveys at Fort Riley have been initiated to provide a complete inventory of prehistoric and historic cultural resources. The ICRMP also identifies and evaluates treatment or protection standards that would ensure the preservation and/or reduction of adverse effects on significant historic properties (e. g., districts, buildings, structures, objects, and archeological sites).

4.3. Health and Safety

This section pertains to the protection of pest management workers and the public from inadvertent exposure to pesticides. Hazard prevention is the primary emphasis. Public health associated with disease prevention is described in Section 4.5, *The Military Mission, Quality of Life*.

Safety is the most important concern in any pest management effort. The most common hazard occurs when workers apply pest management chemicals. Health and safety measures include medical surveillance, hazard communication, and fire protection. These measures are undertaken to monitor health of individuals and protect individuals and the public against exposure to pesticides.

Only individuals certified in the handling, mixing, use and disposal of pesticides perform pesticide applications for control of pests at Fort Riley. Specialized contractors are bonded and licensed in accordance with the requirements outlined for pesticide applicators by the Kansas Department of Agriculture (KDA). State requirements applying to contractors address health protection for pesticide mixing, handling, spraying, and disposal. Pesticides are handled and

applied in accordance with EPA approved labels and Material Safety Data Sheets (MSDSs), which specify procedures designed to ensure human health protection.

Some areas require special care when pesticides are applied. Examples are the child development center, inpatient areas of the Irwin Army Hospital, and family quarters where newborn infants are present. Pesticides are applied according to label instructions and guidance provided in the Armed Forces Pest Management Board (AFPMB) Technical Guide (TG) No. 20, Pest *Management Operations in Medical Treatment Facilities*.

4.3.1. Protection of Children

Health impact to children must be analyzed pursuant to EO 13045 (April 21, 1997), *Protection of Children From Environmental Health Risks and Safety Risks*. This EO recognized that a growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health risks and safety risks. It is the Army's policy to fully comply with EO 13045 by incorporating these concerns in decision-making processes supporting Army policies, programs, projects, and activities. In this regard, the Army ensures that it will identify, disclose, and respond to potential adverse social and environmental impact on children within the area affected by a proposed Army Action.

4.3.2. Environmental Justice

On February 11, 1994, President Clinton issued EO 12898, Federal Actions to Address Environmental Justice in Minority and Low Income Populations. The purpose of this executive order is to avoid the disproportionate placement of adverse environmental, economic, social, or health impact from federal actions and policies on minority and low-income populations or communities.

It is the Army's policy to fully comply with EO 12898 by incorporating environmental justice concerns in decision-making processes supporting Army policies, programs, projects, and activities. In this regard, the Army ensures that it will identify, disclose, and respond to potential adverse social and environmental impact on minority and/or low-income populations within the area affected by a proposed Army action.

In August of 1996, the Federal Facilities Enforcement Office (FFEO) initiated the Federal Facilities Environmental Justice Enforcement Initiative (FFEJEI) (EPA, 1997). The goal of the FFEJEI was to assist in the identification of federal facilities that may pose environmental justice concerns to low income or minority communities surrounding the facilities. This initiative employed several systems to screen federal facilities for possible Environmental Justice concerns:

1. The 191 federal installations that reported releases under the Toxic Release Inventory (TRI) program in 1994 were first screened using the TRI Relative Risk-Based Chronic Health Indicator model.
2. The second screen employed several enforcement databases to evaluate the compliance records of the facilities. In addition the FFEO relied on community reports of environmental justice concerns and geographic distribution to identify facilities posing potential environmental justice concerns.
3. GIS maps were then generated for the 45 sites identified in the two prior screens to illustrate the low income and or minority communities surrounding the facilities.

Based upon this screening process, Fort Riley was identified in the EPA (1997) report as a potential installation of concern for environmental justice concerns.

The initial step in the evaluation of environmental justice considerations posed by a proposed action and its alternatives is the identification of minority and low-income populations that might be affected by implementation of the proposed action or the alternatives. These populations are defined as individuals or groups of individuals that are subject to an actual or potential health, economic, or environmental threat arising from existing or proposed federal actions and policies. In the case of those alternatives evaluated in that EA, those would be individuals or groups of individuals affected by the rerouting of traffic that currently flows onto or across Fort Riley and those who are prevented from entering Fort Riley.

Low-income, or the poverty threshold, is defined as the aggregate annual mean income for a family of four in 1989 correlating to $12,674. Low income and minority population data were compared for Geary and Riley counties, the Fort Riley Region of Influence (ROI), and the State of Kansas. The percent of low-income persons is higher for the Fort Riley ROI (16 percent) than for the State of Kansas (11 percent), while the percent minority population also is higher for the ROI (14 percent) than for Kansas (11 percent). Geary County and Riley County have a higher percentage of minority population (31 and 17 percent, respectively) and also a higher percentage of population below the poverty level (16 and 21 percent, respectively). The community of Junction City in Geary County has the highest percentage of minority population (36 percent), while the City of Manhattan in Riley County has the highest percentage of population below poverty level (25 percent). The high percentage of population below the poverty level in Manhattan is due to the concentration of students at Kansas Sate University (KSU). The City of Ogden also has a higher percentage of low-income population (19 percent) than the overall Fort Riley ROI.

4.4. Transportation

The transportation system of Fort Riley is described because pest management, primarily vegetation control, is conducted along rights-of-way and easements. The transportation systems at Fort Riley consist primarily of a network of on-post and adjacent streets and through roads, the Union Pacific railroad line, and Marshall Army Air Field (MAAF). The primary transportation system is the street and road network. The Union Pacific railhead is the primary deployment system for equipment. Only military aircraft use MAAF.

Fort Riley has more than 250 miles of paved streets and roads, and about 125 miles of unpaved roads, many for military vehicle training. In addition, to maintained tank trails, the installation's training areas are threaded with a vast network of dirt roads and trails. In the cantonment areas, many of the utility lines run adjacent to or underneath paved streets.

The installation is served by an extensive, well maintained, roadway system. In particular, Interstate 70, which is located adjacent to the installation's south boundary, is the major east-west arterial within Kansas. Including Interstate 70, seven principal roadways access the installation:

- Interstate 70 (at Exit 301 onto Henry Drive)
- Grant Avenue from Junction City (at Huebner Road)
- Kansas Highway 18 (at 12th Street, Camp Funston)

- Kansas Highway 18 Extension from Ogden (At Huebner Road)
- Washington Street from Junction City (at Trooper Drive)
- U. S. Highway 77 (at Rifle Range Road)

4.5. Sociological Environment

This section considers the sociological attributes potentially affected by the proposed action. The following attributes are described:

- The demographics of Fort Riley and ROI
- Socioeconomics
- Stakeholders
- Native American and other ethnic concerns
- Visual and aesthetic values

4.5.1. Demographics

Fort Riley lies in portions of Geary, Riley, and Clay counties. The nearest communities to the installation are Grandview Plaza, Junction City, Manhattan, Milford, Ogden, Riley, Wakefield, Bala, and Keats. The area of socioeconomic impact, influenced by Fort Riley, extends beyond Geary, Riley, and Clay counties.

Fort Riley's presence has had a measurable impact upon the overall population and employment levels surrounding the installation. The following sections describe the current demographics and demographic trends for Fort Riley and the surrounding area, defined as the ROI.

4.5.1.1. Fort Riley Population

Fort Riley supports a population of more than 26,000 individuals that comprise approximately 10,300 soldiers, 12,000 family members and 4,000 civilian employees (FY02). More than 14,000 soldiers and family members live on post. Another 19,000 (retirees) are dependent on Fort Riley services. The civilian population consists primarily of DoD civilian employees, non-appropriated funds employees, Army – Air Force Exchange System employees, tenants, and contractor employees. Over 75% of the off-post military personnel reside in Junction City and Manhattan.

Fort Riley processed approximately 32,000 annual and weekend reserve component trainees during FY01. Inactive duty training and annual training for U.S. Army National Guard and U.S. Army Reserve personnel account for almost all of the training man-day equivalents.

4.5.1.2. Regional Population

The area considered as Fort Riley's ROI, as defined by the Economic Impact Forecasting System, incorporates surrounding counties within an approximate 50-mile commute of the installation. Based upon this and other criteria, the ROI for Fort Riley consists of eight counties: Clay, Dickinson, Geary, Morris, Ottawa, Pottawatomie, Riley, and Wabaunsee. Geary and Riley counties, within which Fort Riley is located, receives the majority of the direct and indirect social and economic impacts from Fort Riley. For example, in 2000 over one-third of the population of Geary and Riley counties consisted of active military personnel and family members, and civilians employed at Fort Riley.

U.S. Census Bureau (2001) data show that four of the counties in the Fort Riley ROI experienced population decreases from 1990 to 2000: Geary County (-8.0%), Riley County (-6.0%), Clay County (-4.0%) and Morris County (-1.0%). The remaining four counties experienced an increase in population over that period, ranging from 2.0% (Dickinson County) to 12.0% (Pottawatomie County). The decrease in population in Geary and Riley counties can be attributed to military downsizing and realignments at Fort Riley. Operational levels at Fort Riley directly affect these two counties because they are the primary residency areas for the off-post military personnel and civilians employed at Fort Riley.

4.5.2. Economics

Employment is a primary factor in analyzing the economic health of a community since comparison of trends reveals strengths and weaknesses and offers direction for actions designed to promote the strengths and to overcome the weaknesses. As shown in Table 4.3, the total labor force in the tri-county area increased during the twenty-year period 1980-2000 with the greatest increase, 9.6%, occurring in Riley County. Clay County and Geary County, respectively, showed a 12.1 and 0.59 decrease in the labor force during the same period.

Within the tri-county area, the overall unemployment rate has shown a slight downward trend during the past ten years. This overall unemployment trend was from 4.6% to 4.0%. This is an indication of a fairly stable economic environment.

The 2000 unemployment rate was two to three percent for the ROI (except for Geary County, which had a 5.9% unemployment rate). Fort Riley, KSU, and Unified School Districts #383 and #475 are the largest employers in the region.

According to the U.S. Census Bureau (2001), the median household income in 2000 for the Fort Riley ROI ranged from $31,917 in Geary County to $41,710 in Wabaunsee County. The statewide median household income was $40,624.

Table 4.3. Civilian Labor Force, 1980 – 2000.

	Total Work Force			**Total Employed**		
County	*1980*	*1990*	*2000*	*1980*	*1990*	*2000*
Clay	5,078	4,011	4,639	4,916	3,840	4,497
Geary	8,979	11,545	10,076	8,384	10,855	9,432
Riley	21,278	29,426	30,811	20,471	28,352	29,707

Source: Policy Research Center, University of Kansas, 2002

The presence of Fort Riley is economically beneficial to the surrounding area. In terms of its financial impact, Fort Riley contributed over $614,711,430 to the local economies in Fiscal Year 2002; i.e., October 1, 2001 through September 30, 2002 (Table 4.4).

The operations at Fort Riley generate substantial revenues to local economies through wage and salary payments to military and civilian employees, construction contractor payments, and

operating costs such as rent and lease payments for various types of equipment, utilities, telephone, office supplies, and non-construction contracts.

Table 4.4 Fort Riley Expenditures, Fiscal Year 2002	
Activity	**Amount ($)**
Military Pay	331,055,898
Civilian Pay	105,437,362
Army Retirees	144,397,628
Contracts, Supplies, and Services	44,751,626
Construction Projects	18,322,144
Other Miscellaneous Expenditures	44,554,056
Total	**688,518,714**
Source: *Directorate of Resource Management, Economic Impact Summary FY 2002 Fort Riley, Kansas*	

Purchases in the area by more than 10,300 military personnel assigned to Fort Riley and their 12,108 family members make a significant contribution to the retail and service segments of the local economy.

The positive contribution of Fort Riley can be expressed in another way – induced direct and indirect employment, or the number of jobs that are induced in the private sectors as a direct result of military troop levels and off-post expenditures. Despite the apparent day-to-day operation of Fort Riley as a self-sustaining installation, personnel and their dependents make considerable use of retail and service facilities, while the various groups and commands on-post annually contract or purchase millions of dollars in goods, services and equipment from area businesses. The concept of induced employment related to military installations was addressed in a number of studies and these studies have developed multipliers which can be used to estimate the number of jobs which are created based upon an installation's military population and the number of civilians employed.

The multipliers to be used to estimate the induced employment associated with the number of military personnel assigned to an installation range from 1.08 to 1.80. Put another way, this means that between 108 and 180 permanent jobs will be created in the private labor sector for each 100 military personnel assigned. Carrying the concept on a step further means that from 11,124 to 18,540 jobs in the surrounding community have been created to support the 10,300 military personnel assigned to Fort Riley.

The civilian employees at Fort Riley also have an impact on private employment in the surrounding communities. They spend a high proportion of their take-home pay, i.e. disposable personal income in the local communities. Consequently, civilian workers at Fort Riley induce a proportionately higher number of jobs in the private sector than do the military personnel. It is estimated that the employment multiplier for civilian employees ranges between 2.5 and 3.0.

This means that between 250 and 300 jobs are created for each 100 civilian employees at Fort Riley. On this basis, from 10,250 to 12,300 jobs are created to cover the more than 4,168 civilians employed on Fort Riley.

Based upon the foregoing analysis, the employment induced into the area around Fort Riley (from the multiplier effect of assigned military personnel and civilian employees) could range from as low as approximately 21,374 jobs to a high of around 30,840 jobs. The total civilian employment in the tri-county area surrounding Fort Riley totaled 43,542 in 2000. If the civilian employment on-post and the maximum induced employment off-post are considered, almost 75 percent of the tri-county jobs can be attributed to the presence of Fort Riley.

Although Fort Riley is independent in terms of its water supply and sewage disposal, the post depends upon the civilian sector for electrical energy, natural gas, fuel oil from local distributors, and commercial telephone service.

4.5.3. Stakeholders

Pest management on Fort Riley requires collaboration and coordination with and input from many internal and external stakeholders. For example, day-to-day operations require extensive coordination with installation personnel and organizations. The DoD and the DA are stakeholders because they establish pest management policy, guidance and direction. Meanwhile, external state and federal agencies provide policy input, technical and logistical assistance and review of operations.

4.5.3.1. Primary Installation Personnel and Organizations

Six installation organizations are concerned with the pest management program. The first is the Command Group that includes the Commanding General, and Chief of Staff. The Command Group, as indicated in the 2004 IPMP is responsible for overall mission accomplishment at Fort Riley. The Command Group also is responsible for implementing any portion or all of the 2004 IPMP.

There are six Directorates or Activities that are affected by or can affect pest management on Fort Riley. These are DES, DCA, G3, DPW, Veterinary Services (VETCOM) and MEDDAC.

The Pest Management Program is an on-going activity at Fort Riley under the general supervision of the IPMC in the DES Conservation Division. Pest management is undertaken at the request of G3 to support military training. Military units, personnel, housing residents and civilian employees as a customer base at Fort Riley also are stakeholders in pest management. Lastly, the Environmental Quality Control Council (EQCC) is a Garrison Commander-chaired council where environmental issues, including pest management, are discussed with the garrison and military command of Ft. Riley.

4.5.3.2. Other DoD

Three external DoD organizations are stakeholders in pest management on Fort Riley. The Northwest Regional Office of the Army's Installation Management Agency is Fort Riley's next highest headquarters. It provides technical and monetary assistance through the Army Environmental Center (AEC) to implement pest management programs per AR 200-5. AEC has review and approval authority for the 2004 IPMP. The AEC, a field-operating activity of the Army, is the central point of coordination of Army environmental programs, including pest

management. The U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) provides assistance to the installation's pest management staff.

4.5.3.3. Outside Agencies

Federal and state agencies responsible for pest management collaborate with Fort Riley. Federal agencies include the USDA and the U.S. Department of the Interior (USDOI). The USDA includes the U.S. Forest Service, the Natural Resource Conservation Service, the Extension Service and the Animal-Plant Health Inspection Service (APHIS). The installation frequently cooperates with the USFWS and U.S. Geological Survey (USGS) within the USDOI.

The two primary state agencies are the Kansas Forest Service (KFS) and the KDA. The KFS provides insect and disease updates. The KFS also surveys invasive and exotic forest insect eruptions in cooperation with the KDA and the APHIS, Plant, Protection and Quarantine Service. Fort Riley cooperates with the agencies to survey pests of concern, such as gypsy moth and Japanese beetle.

The Federal Noxious Weed Law (Public Law 93-629) requires that Federal agencies comply with all state laws governing the control of noxious weeds. The Plant Protection and Weed Control Division of the KDA is responsible for implementing the state's noxious weed protection laws throughout Kansas, including Fort Riley. The State Noxious Weed Coordinator and local county noxious weed officers conduct periodic checks and inspections for noxious weeds and their control. The installation provides an annual report to the state on control efforts and surveys. An annual meeting each fall addresses efforts and plans for future control. Fort Riley has entered into two Memoranda of Understanding agreements that define compliance and relationship between the two agencies. The Geary and Riley County Weed Departments inspect installation lands periodically for noxious weeds. The KDWP may be consulted with pertaining to the effects of pest management on fish and wildlife.

Fort Riley collaborated with KSU-Cooperative Fish and Wildlife Research Unit, USGS to determine and evaluate best management practices in controlling pests, reducing chemical usage, and minimizing negative effects on the environment (KSU, March 2003). The MoM #2, Pesticide Usage Reduction by 50%, highlighted the need to improve methods and effects of installation pest control. The research evaluated pre-study control of pests versus newer chemical and application technology and nonchemical pest control. New chemical technology was evaluated against past chemical controls as well as various application rates and delivery systems for reducing pesticide quantities while maintaining acceptable control levels. Potential for ground water contamination and negative effects also were within the scope of the study.

4.5.3.4. Customers

The customers served through the pest management program are diverse and widely dispersed. The installation's Organizational Self-Assessment (Fort Riley, 2000) states that the installation's key customers are units, soldiers, and soldiers' families. Taking care of these customers is a primary pest management responsibility. Other interested parties include the state and federal natural resources management agencies such as the KDWP and the USFWS.

4.5.3.5. Native American and Other Ethnic Concerns

Less than one percent of the population in the Fort Riley ROI is identified as being Native American according to the 2000 U.S. Census. Approximately three percent are identified as being of Hispanic origin, with approximately two percent being of Asian/Pacific Islander origin.

The American Indian Religious Freedom Act (AIRFA) and EO 13007 requires consideration of Native American Religions. The installation has a set of SOPs and two Comprehensive Agreements (CAs) that address Native American concerns under the Native American Graves Protection and Repatriation Act (NAGPRA).

NAGPRA requires agencies to inventory their collections, publish information, and then repatriate to the appropriate "culturally affiliated" Native American tribe all human remains and associated cultural items. The act also requires consultation with such tribe(s) prior to planned excavation; and in the case of accidental discovery to stop work for at least 30 days while consultation occurs.

4.5.4. Recreational Activities

Common outdoor recreational activities at Fort Riley include organized youth sports (e.g. football, soccer, softball), golf, bird watching, hunting, hiking, fishing, mushroom hunting, walnut gathering, and mountain biking. The organized youth sports take place predominately in the Whitside and Forsyth areas in the southern portion of the installation. The other activities occur throughout the installation, except where prohibited (e.g. within the installation's permanent impact area).

Hunting and angling in particular account for many recreational outings taken by soldiers, their families, and the general public. During the 2002/2003 hunting season, 2,800 hunting trips were reported. The general public, including many non-residents, accounted for approximately 45% of the hunting trips. Creel censuses during past years indicate that as many as 35,000 fishing trips are taken on Fort Riley each year. The general public takes approximately 30% of these.

4.5.5. Visual and Aesthetic Values

Fort Riley is richly endowed with natural resources that greatly enhance the aesthetic value of the area. Located in the Flint Hills, the area conveys an image of rolling prairie hilltops with rugged riparian valleys; quality streams; and an abundance of fish and wildlife. The major stream corridors have retained much of their natural appearance and the Flint Hills bluffs and ridges provide panoramic views.

The installation's layout reflects natural features, formal and informal designs, and distinctive styles and building materials. Features such as rivers, floodplains, hillsides impose natural appearing constraints on the physical layout of Fort Riley. Cantonment (urban) areas appear interwoven among the natural features and interconnected with one another.

The aesthetics of the MPHD combined with ample green space produces very pleasing visual values. The MPHD is characterized by aesthetically pleasing native limestone buildings that are arranged in pleasing spatial relationships. Fort Riley's retention of the historical character of the MPHD is the primary contributing factor in aesthetics. The use of planted vegetation combined with natural systems has produced pleasing horticultural associations. Significant natural areas that remain relatively undisturbed include substantial wooded areas with native prairie tracts. These natural areas are interspersed with improved and semi-improved grounds.

4.6. Military Mission

This next section details the relationship between pest management and mission activities. The military mission is an element of the affected environment. It is an institutional consideration that is affected by pest management. Fort Riley has identified three "Key Processes" for support

of the ongoing mission. These are Training and Operational Readiness, Quality of Life and Environmental Stewardship.

4.6.1. Overview

Fort Riley is a permanent U.S. Army installation with the primary mission to provide training, facilities, housing, and support to the 24th Infantry Division (Mechanized). Fort Riley was designated a War Fighting Center during 2002 as a result of Army transformation that more fully integrates Army Reserve units. Typical training operations, which occur throughout the year on a daily basis at Fort Riley, involve field maneuvers, combat vehicle operations, mortar and artillery fire, small arms fire, and aircraft (primarily helicopter) flights.

Wide ranges of activities occur on a regular basis at Fort Riley to conduct and support the Fort's assigned training mission. Many "ongoing activities" are essentially public works and commercial service functions required to allow people to live and work on the installation. Many of these activities are similar to those conducted in any non-military community of equal size, and include the following types:

- Administrative operations;
- Housing;
- Airfield operations;
- Facilities repair, maintenance, construction, and alteration;
- Fuel and petroleum storage and dispensing;
- Grounds maintenance;
- Hospital, medical, and dental clinic operations;
- Installation and community support services;
- Natural and cultural resources management and environmental protection;
- Recreation;
- Road and right-of-way maintenance;
- Utility operations including infrastructure maintenance, repair, construction, and alteration;
- Warehousing and supply storage; and
- Vehicle and equipment maintenance and repair.

4.6.2. Training and Operational Readiness

Pest management is undertaken to support operations and readiness by protecting infrastructure, equipment and personnel from adverse effects of vector-borne disease, and destructive and nuisance pests. The primary mission at Fort Riley is the training, housing, and support of military forces for deployment in support of contingency operations. Pest management has implications for training, housing and the well being of soldiers and their families

The three combat brigades, 1st Brigade 1st Infantry Division, 3rd Brigade 1st Armored Division, and 937th Engineer Group (Combat), stationed at Fort Riley have similar missions. They will, on order, deploy with or without equipment, build combat power, conduct military operations in

support of the full range of worldwide contingency operations, and then redeploy. The installation is required to:

- Prepare for and assist in the deployment of Active and Reserve component units for their wartime missions.
- Plan, coordinate, and prepare for mobilization, activation, training, and deployment of reserve component units and individuals.
- Assist tenant activities in the accomplishment of their missions.
- Take care of soldiers and their families and provide a quality environment in which to live and work.

4.6.3. Quality of Life

Quality of Life is the installation's key process supporting soldiers and family members (Fort Riley Organizational Self-Assessment, 2000). Quality of Life on Fort Riley consists of morale, welfare and recreation. Pest management activities directly affect these three components. Pest control affects morale by reducing nuisance (stinging and biting) insects and nuisance wildlife that interface with military activities. For example, birds in hangars are nuisances when their droppings fall on soldiers maintaining equipment. Morale of soldiers also is affected indirectly by degraded equipment readiness when rodents chew through wiring. Welfare of soldiers, families and employees are affected by efforts to control vector-borne diseases in mosquitoes, other arthropod and nuisance wildlife. Recreation is affected by pest control efforts to protect the functionality of recreational facilities. An example is pest control to reduce turf damage at the golf course.

4.6.4. Environmental Stewardship

Cost effective environmental stewardship is a "Key Support Process" identified in Fort Riley's Organizational Self-Assessment (2002). The stewardship goal of Fort Riley's pest management program is to maintain ecosystem health and integrity while providing for military training and quality of life of the installation's personnel and others.

Special consideration must be given prior to conducting pest control operations in sensitive environmental areas that are identified on pesticide labels. No pesticides are applied directly to wetlands or water areas (lakes, rivers, etc.) unless its use is specifically approved on the label. In addition to aquatic habitats, sensitive areas also include critical habitat to endangered and threatened species. Chemical control projects are coordinated with other DES Conservation Division personnel prior to any pesticide applications in sensitive areas.

The pest management program, as outlined in the 2004 IPMP, complies with the Fort Riley Pollution Prevention Plan and EO 12856 of August 3, 1993, Federal compliance with Right-to-Know laws and pollution prevention requirements. IPM strategies that stress nonchemical control, as appropriate, form the basic framework of the pest management program.

5.0 ENVIRONMENTAL CONSEQUENCES

The Environmental Consequences section is the scientific and analytical basis for comparison of the alternatives. Impact assessment matrices and related narratives in this section consider the

effect of the No Action and the Full Implementation alternatives on the Affected Environment, as described in Section 4.0. This section describes probable consequences of each alternative on selected environmental resources and associated attributes. The resources and their attributes that are assessed are those directly linked to the relevant issues listed in Section 1.0, *Purpose and Need*.

Effects are changes from the current situation. The expected changes are described in quantitative and qualitative terms to aid in evaluating and contrasting the alternatives. The degree of change is described in terms of significance, duration and magnitude. The section includes discussion of:

- Direct effects and their significance.
- Indirect effects and their significance.
- Cumulative effects and their significance.
- Long and short-term effects.
- Unavoidable effects and any mitigation measures that would be implemented.
- Possible conflicts between the proposed action and the objectives of federal, regional, state, and local land use plans, policies and controls for Fort Riley.
- Any irreversible and irretrievable resource commitments.

The Army will use the information in this section to help determine which of the identified alternatives will be implemented.

Section 5.0 is organized by alternative, and the impact associated with each alternative. Resource impact assessment matrices have been included near the beginning of each subsection to summarize the impact of proposed actions and related alternatives. The reader should refer to the text narrative for information regarding the specific nature and extent of impact illustrated in these generalized summary matrices. The presence of impact, however, does not necessarily equate to significant impact. Impact can be minor and localized and not rise to the level of significance. Significance is determined based on magnitude and duration.

Each of the "Alternatives" section is divided into subsections evaluating effects to land use, natural resources related attributes (abiotic and biotic), cultural resources, human health and safety, the sociological environment and the military mission.

5.1. Definition of Key terms

5.1.1. Direct versus Indirect Impact

The terms consequences, impact and effect are synonymous as used in this EA. Impact may be determined to be beneficial or adverse, and may apply to the full range of natural, aesthetic, historic, cultural, and economic resources of the installation and its environs. Where applicable, impact may be classified as direct or indirect. Definitions and examples of direct and indirect impact as used in this document are as follows:

- **Direct Impact.** *A direct impact is caused by the proposed action, and occurs at the same time and place*. For example, loss of tree cover would be classified as a direct impact associated with construction of a new building on an existing woodland site.

- **Indirect Impact.** *An indirect impact is caused by the proposed action and is later in time or farther removed in distance, but still reasonably foreseeable*. Indirect impact may include induced changes in the pattern of land use, population density or growth rate, and related effects on air, water, and other natural and social systems. Referring to the direct impact described above, the clearing of trees for new development may have an indirect impact on area streams by increasing the amount of soil erosion and sediment that reaches these streams during construction.

5.1.2. Short-term versus Long-term Impact

In addition to indicating whether impact is direct or indirect, the environmental consequence analysis also distinguishes between short-term and long-term impact. In this context, short-term and long-term do not refer to any rigid time period and are determined on a case-by-case basis. In cases where both short-term and long-term impact is expected, the impact evaluation matrices generally illustrate the long-term consequences. Referring to the direct and indirect impact examples described above, the clearing of trees on a new construction site would be classified as a long-term impact, while erosion and siltation in nearby streams during the construction period would be classified as a short-term impact.

5.1.3. Significance

The term "significant", as defined in Paragraph 1508.27 of the regulations for implementing NEPA (CEQ 40 CFR 1500 et seq.), requires consideration of both the context and intensity of the impact evaluated. Significance can vary in relation to the context of the proposed action, and thus the significance of an action must be evaluated in several contexts and this varies with the setting of the proposed action. For example, context may include consideration of effects on a national, regional, and/or local basis depending upon the action proposed. Both short-term and long-term effects may be relevant.

In accordance with Paragraph 1508.27 of the regulations and the CEQ implementing guidance, impact also is evaluated in terms of their intensity or severity. Factors contributing to the evaluation of the intensity of an impact include, but are not limited to:

- The degree to which the action affects public health or safety.
- Unique characteristics of the geographic area where the action is proposed such as proximity to parklands, historic or cultural resources, wetlands, prime farmlands, wild and scenic rivers, or ecologically critical areas.
- The degree to which the effects on the quality of the human environment are likely to be controversial.
- The degree to which the effects of the action on the quality of the human environment are likely to be highly uncertain or involve unique or unknown risks.
- The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
- Whether the action is related to other actions with individually insignificant but cumulatively significant impact. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

- The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.
- The degree to which the action may adversely affect an endangered or threatened species or its habitat that was determined to be critical under the Endangered Species Act of 1973.
- Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

An Environmental Impact Statement (EIS) would be required if it is determined, as part of this Environmental Assessment, that the alternative chosen for implementation would create significant impact. The EIS would investigate impact in more detail as well as identify mitigation strategies designed to minimize impact.

5.2. Effects of Full Implementation Alternative

Full implementation of the 2004 IPMP is anticipated to have an overall moderate positive effect on all six major environmental areas: land use, natural and cultural resources, human health and safety, sociological environment and military training (Table 5.1).

Specific beneficial effects or no effect would result for all major attributes of these areas except for minor, short-term negative effects to soils.

Discussion of effect of noxious weed control is not included in this EA. A detailed analysis of environmental impact from noxious weed control, including aerial spraying, is discussed in the *Revised Final Programmatic Environmental Assessment of Integrated Approach to Noxious Weed Control Including Aerial Spraying of Herbicides*, June 2002, and *Final Programmatic Environmental Assessment of Integrated Approach to Noxious Weed Control Including Aerial Spraying of Herbicides*, October 2001.

The installation would implement an IPM approach that supports the military mission. There would be a formal, integrated management plan for the pest control. In addition, a formal set of management measures would enhance the installation's ability to adequately engage in future strategic planning and new initiatives. It would capture benefits derived from identifying and executing comprehensive, integrated pest management actions. This alternative would be based on the principle of IPM that takes into account the inherent dynamics of pest populations and changes in the military mission.

The proposed action is consistent with the goals of Fort Riley's pest management program to ensure sustainability of land use to support desired military missions; to maintain, protect and improve human health and welfare; to protect and enhance biological communities, particularly sensitive, rare, threatened and endangered species; to protect native biodiversity components from unacceptable damage or degradation. The management measures recommended in Fort Riley's 2004 IPMP, if implemented, would directly and positively affect environmental conditions at Fort Riley. Therefore, this is the preferred alternative.

Table 5.1 Anticipated Effects of Full Implementation

	Direct Effects	Indirect Effects	Short-Term Effects	Long-Term Effects
Land Use	O	+	O	+
Natural Resources				
Soils	_	+	_	+
Water	O	+	O	+
Air	_	O	_	O
Native Biodiversity	-/+	+	-/+	+
Cultural Resources	+	+	+	+
Health and Safety	-/+	-/+	-/+	+
Impact on Children	+	+	+	+
Environmental Justice	O	O	O	O
Sociological Environment				
Socioeconomics	O	O	O	O
Stakeholders	+	+	+	+
Visual Values	+	+	+	+
Military Mission				
Training and Operational Readiness	+	+	+	+
Quality of Life	+	+	+	+
Environmental Stewardship	+	+	+	+

Impact expected: (+) positive (-) negative (0) none

5.2.1. Land Use

Direct or indirect adverse impact to land use practices is not anticipated with the Full Implementation alternative. The Pest Management Program under the 2004 IPMP is compatible with facilities and existing land use practices. Land use would benefit indirectly during the long-term. Beneficial effect would be moderate.

Noxious weed control integrated with natural resources management would benefit the prairie ecosystem and, consequently result in stable land use by the military. The indirect benefits accruing from integrated control of noxious and nuisance weeds in the cantonment relate to maintenance and use of recreational areas such as tennis courts, the golf course, athletic and parade fields, paved areas and buildings. Noxious weed control would benefit other land uses such as the Agriculture Outlease program.

5.2.2. Natural Resources

It is anticipated that both abiotic and biotic attributes generally either would benefit from Full Implementation or there would be no effects. Beneficial effect would be moderate. The protection of natural resources, ecosystem integrity and biodiversity are specified objectives (Section 2.3.1 of this EA).

Natural resources would benefit from noxious weed control that protects ecosystem integrity. Control of feral and exotic animals such as swine also protects ecosystem integrity. The 2004 IPMP includes Standard Operating Procedures to protect against accidental spill and release of chemicals into the environment. Strict adherence to the legal requirements discussed in the 2004 IPMP reduces potential for environmental degradation.

Additional protective measures would be established to protect aquatic and terrestrial systems on Fort Riley. "No aerial spray" buffers would be established to preclude contamination of sensitive habitats. A 900-foot buffer would be established around aquatic habitats in the eastern portion of the installation. A 100-foot buffer would be established around aquatic habitat in the western portion and around forests with canopies equal or greater than 25% cover.

5.2.2.1. Soils

Soils, generally, would benefit as a result of a stable prairie ecosystem that minimizes soil erosion potential. Pest management activities that maintain a stable prairie ecosystem would produce long-term, moderate and indirect benefits.

Minor short-term adverse effects are anticipated from residues of herbicide on the surface of soil in areas that have been sprayed with herbicides. Under the Full Implementation Alternative, herbicides applied to control unwanted vegetation would likely leave residues in soils. Some herbicides are more persistent in soils than others. The frequency of application, in combination with persistence, are factors that affect the concentration of herbicide residues remaining in soil. The amount of herbicide applied per acre is directed by labels and is typically low. Accumulation of herbicide residues in soils at Fort Riley is not anticipated due to the following factors:

- The limited acres treated with herbicides;
- The small amount of herbicide allowed by labels to be applied per acre;
- The overall low annual amount used;
- The low frequency of use; and
- The rapid degradation of herbicides in soils.

The loss of surface plants from herbicide treatments or prescribed burning has the potential to promote soil erosion at treated areas. However, weed control using these methods has not been notable contributors to erosion problems at Fort Riley in the past. The continuation of weed control management programs is not expected to cause troublesome erosion in the future. Negligible impact would occur as a result of soil sterilants being sprayed around fences, on motor pools parking lots and signage. Lack of vegetation would make these localized areas more susceptible to erosion.

Other pest management priorities would have no effect on soils. Integrated control of medically important arthropods, disease vectors and nuisance wildlife would have no effect of soils. Prevention of pests that destroy Army property or stored food products would not affect soils.

5.2.2.2. Water

Direct adverse impact to water resources under the Full Implementation Alternative is not anticipated. The 2004 IPMP requires two primary safeguards to prevent contamination of both surface and ground water. First, the 2004 IPMP for Fort Riley requires pesticides to be applied in accordance with product labels. It further specifies that only individuals certified to handle, use and apply these chemicals would apply herbicides.

Minor indirect adverse impact to water quality under the Full Implementation Alternative is anticipated from potential accidental drift of herbicides to surface waters when herbicides are applied from aircraft. The potential for contamination of surface water from accidental drift of herbicides when aerial spraying would expected to be minimized by the establishment of buffer areas (100-foot and 900-foot depending on the herbicide and location) areas around surface waters. Secondly, aerial spray of herbicides will not be conducted when wind speeds are greater than 10 miles per hour.

Indirect, long-term beneficial effects could potentially occur. The maintenance of ecosystem integrity by controlling sericea and other noxious weeds would be expected to reduce the potential for soil erosion and increased turbidity into surface water. Control of feral swine would also indirectly prevent degradation of water quality from turbidity caused by rooting along stream banks.

Other important pest management priorities would have no effect on water. Use of larvicides to control mosquitoes would not degrade water quality. Prevention of pests that destroy Army property or stored food products would not affect water.

Surface Water

Application of chemical controls is not expected to directly affect surface water. The direct application of herbicides to surface water is not anticipated because herbicides, which are labeled for use on-land, are seldom, if ever, labeled for treatment of aquatic plants. Most herbicide labels reviewed specifically caution applicators to avoid spraying herbicides on surface waters (includes wetlands). Even when best management practices are employed, accidental drift of herbicides away from the spray area may occur. The “no aerial spray” buffer zone placed around water resources would minimize the potential for contamination of surface water from accidental drift of herbicides when aerial spraying.

Specific pesticides would be applied according to label for the control of mosquitoes and aquatic pests. Larvicides are applied in mosquito breeding areas (water impoundments, open containers, non-draining ditches, etc.) on post. Use of larvicides to control mosquito populations is not anticipated to adversely affect surface water. Larvicides are primarily applied to small standing pools of water that are not interconnected to streams or lakes. Aquatic pests consist of weedy aquatic vegetation, green sunfish, black bullheads and various rough fish. Twenty-nine ponds and lakes within the post are managed to support recreational fishing interests. Ponds are treated with herbicides like Aquazine (a form of 2,4-D), Rodeo, and Simazine to control vegetation. Rotenone and a formulation of that chemical, Pronoxfish, and are sometimes used to control fish species balance in ponds.

Indirect effect to surface water is not anticipated from use of chemicals, including herbicides to control unwanted vegetation. The herbicides used on Fort Riley degrade rapidly in soils after application. Given the minimal frequency and amount of herbicides used yearly at Fort Riley, there is limited potential for accumulation in soils. This would limit the potential for soils with residual herbicides to be carried in sufficient quantity or concentration to surface waters located

Prescribed burns and herbicide treatments may indirectly and adversely affect surface waters. The adverse effect is expected to be negligible. The loss of surface plants from prescribed burns and herbicide treatments has the potential to promote soil erosion at treated areas, causing runoff water and surface water in nearby creeks, streams or rivers to increase in total suspended solids (TSS), turbidity, thereby reducing water quality.

Mechanical and physical, biological and cultural controls to control animal pests, and protect Army property and stored food products are not expected to directly affect surface water. Indirect benefits to surface water from the control of feral swine would be anticipated.

Groundwater

The Full Implementation Alternative is not expected to affect groundwater except through use of chemical controls of unwanted vegetation. The risk of direct groundwater contamination with herbicides is considered low. Reasons include low herbicide application rates, the limited quantities used annually at Fort Riley, and the infrequency of treatment.

The most direct mode of possible groundwater contamination is through transport in soils. Transport is dependent on both persistence and mobility in soils. The relative persistency of these herbicides is low with average half-lives in soil ranging from 10 to 56 days. Remedy™ and Oust™ have been found to have higher relative mobility in soil.

Another mode of potential transport of herbicides to groundwater is through the root system of plants. The downward movement of herbicides through the plant rooting zone would reduce the concentrations in surface soil, but may ultimately lead to groundwater contamination if applications were frequent during the growing season.

Wetlands

Direct or indirect negative impact to wetlands is not anticipated the Full Implementation Alternative. Pest control programs such as golf course management, noxious weed control and Agriculture Outlease that employ chemical controls would not affect wetlands. The current policy at Fort Riley is to avoid spraying herbicides in wetland areas or use herbicides approved for use in and around wetlands. The other methods of vegetation control currently employed at Fort Riley (i.e., prescribed burns, cultivating, biological) are not expected to have a direct adverse impact on wetlands. Mechanical and physical, biological and cultural controls to control animal pests, and protect Army property and stored food products are not expected to directly affect wetlands.

Indirect, long-term benefits are anticipated. Pest management activities that enhance ecosystem stability would promote functional wetlands. Indirect benefits to wetlands from the control of feral swine would be anticipated.

5.2.2.3. Air Quality

Minor short-term direct adverse impact is anticipated under the 2004 IPMP. Prescribed burns would cause short-term increases in air particulate matter and complex pyrogenic organics in

burn areas. Herbicide spraying would cause minor short-term adverse impact to air quality from herbicide mist in the air, dust (PM10) from driving spray vehicles over gravel or dirt roads and exhaust from spray vehicles and aircraft. Mechanical controls such as cultivation would produce negligible adverse effect to local air quality from dust produced by cultivation. Impact to air quality would be temporary and minimal because the activities are not continuous emission sources.

Indirect adverse air quality impact is anticipated from conducting prescribed burns under the 2004 IPMP. Smoke from prescribed burns has the potential to be carried well beyond burn areas by prevailing winds. The drift of herbicide mists downwind of spray areas is expected to cause minor indirect adverse impact to air quality. Best management practices applied when aerial spraying is conducted are expected to minimize the drift of herbicides away from target areas. Consequently the potential for indirect air quality impact from aerial spraying of herbicides is expected to be minor.

Mechanical and physical, biological and cultural controls to control animal pests, and protect Army property and stored food products are not expected to directly or indirectly affect air quality. Integrated approaches such as sanitation measures, elimination of harborage and habitat, screening or exclusion would not produce any effect to air quality.

5.2.2.4. Native Biodiversity

This section analyzes effects to native flora and fauna, including T&E and rare species. Pest management affects an extensive portion of Fort Riley's land base. In addition to this assessment, the *Revised Final Programmatic Environmental Assessment of Aerial Spraying for Noxious Weed Control at Fort Riley, Kansas*, dated June 2002 was completed to ensure complete environmental review. That programmatic EA is a detailed analysis of the effect of noxious weed control on native biodiversity. Therefore, this IPMP EA will not include an in-depth analysis of the effect of noxious weed control.

Direct and indirect adverse impact to native biodiversity, generally, is not anticipated under the Full Implementation of the 2004 IPMP. Fort Riley's 2001 Endangered Species Management Plan and pertinent sections of the Integrated Natural Resources Management Plan are documents that support the 2004 IPMP. The former two documents establish management goals and objectives that are followed in the 2004 IPMP. In the long-term, integrated control of pests, including exotic organisms, under the IPMP would benefit native biodiversity.

The 2004 IPMP Implementation alternative would apply combinations of methods to control pests at Fort Riley. Pest control methods may include mechanical (e.g., mowing and cultivating), biological (e.g., insects, viruses, herbivore grazers), cultural (prescribed burns and reseeding), and chemical application (e.g., spraying by hand, from spray vehicles, or spraying from aircraft) or combinations of these methods in an integrated program to establish control while minimizing risk to the environment.

Native Flora

Adverse and beneficial impact to plant communities from Full Implementation of the 2004 IPMP is expected. The effect of chemical, cultural, mechanical and biological control of noxious weeds are analyzed in-depth in the *Revised Final Programmatic Environmental Assessment of Aerial Spraying for Noxious Weed Control at Fort Riley, Kansas*, dated June 2002

Integrated control of pests that harm native plant communities would produce long-term, indirect benefits. Prescribed burning is expected to have an indirect benefit by maintaining the assemblage of native prairie plants, thereby preserving quality prairie plant habitat. Chemical control of unwanted vegetation would be expected to promote the reclamation of prairie grasses during the long-term. The indirect benefits of establishing successful biological control would be the reduction of chemical usage, and saving money on costly control methods, such as mowing or hand pulling, which must be repeated every year. Control of feral swine would be expected to benefit long-term ecosystem integrity. Native plant communities along riparian areas are susceptible to rooting and destruction by feral swine.

Other pest control functions under the 2004 IPMP such as golf course management, protection of Army property, control of medically important arthropods would not affect native floral communities. Activities such as sanitation and hygiene, pest surveillance also would no affect floral communities.

Native Fauna

Adverse and beneficial impact to fish and wildlife species as a result of fully implementing the 2004 IPMP is expected. Direct and indirect adverse impact would be minor and occur during the short-term. Long-term indirect beneficial effect is anticipated as a result of protection of natural resources and of pest control that sustains ecosystem integrity.

Minor direct and short-term adverse impact to terrestrial wildlife is expected from the current practice of prescribed burning of rangeland areas in the non-cantonment. Mechanical methods of pest control such as mowing, and cultivating and reseeding are expected to have a minor direct and short-term adverse impact on wildlife. Integrated pest control currently employed at Fort Riley (i.e., prescribed burns, cultivation, biological control) is not expected to have a direct adverse impact on fish and aquatic invertebrates.

Direct adverse toxic effects are not anticipated to fish and wildlife from the Full Implementation of the 2004 IPMP. Herbicide use is not expected to have a direct toxic impact on mammals. Direct impact to fish and aquatic invertebrates are not anticipated from herbicides under the Full Implementation Alternative even if spraying occurred directly on surface water. The avoidance of herbicide application over streams, ponds and rivers, as specified in the 2004 IPMP is expected to further reduce the risk to fish.

Indirect adverse impact to terrestrial wildlife is anticipated from the use of herbicides under the Full Implementation Alternative. Potential indirect, adverse impact to wildlife may occur due to the potential for diminishing the quality and diversity of the rangeland plant community when herbicides are used to control noxious weeds. Reduced plant diversity also would result in lower insect diversity. These impacts would be minor and occur during the short-term.

Indirect, long-term beneficial effects would be expected. Vegetation communities would be maintained and protected from degradation over the short- and long-term providing habitat that would support fish and wildlife populations. Improved habitat due to elimination or reduction of non-native noxious weed species to an acceptable level would be a long-term positive impact from noxious weed management.

A critical indirect beneficial effect of the 2004 IPMP is of less reliance on chemicals is the lessening of potential resistance of pests to pesticides. Pesticide resistance is defined as the ability of a pest population to withstand pesticide treatments that were generally lethal to earlier

populations. Its occurrence is most widely documented in the three groups of pests most frequently targeted for pesticide applications - arthropods, rodents and weeds.

Control of nuisance wildlife would not cause significantly adverse impact to wildlife. Only nuisance pests with the potential to affect health and safety would be controlled. Most control efforts involve trapping and removal of individual animals. Control of feral swine would be expected to indirectly benefit native wildlife species. Selective removal of animals may have the effect to reduce disease potential among wildlife populations.

Threatened and Endangered Species

Integration of management goals and compliance requirements for T&E and rare species, noxious weeds, and pest management will ensure that management activities are compatible. The 2004 IPMP specifically addresses the protection of T&E species. The 2004 IPMP is consistent with Fort Riley's 2001 Endangered Species Management Plan (ESMP) and pertinent sections of the 2001 Integrated Natural Resources Management Plan (INRMP).

Direct and indirect adverse impact to federal T&E species is not anticipated as a result of implementation of the 2004 IPMP. Indirect, long-term beneficial effects would be expected. Indirect benefits to listed and rare species, and their habitats would be expected from the control of other exotic organisms such as feral swine. The removal of ecologically destructive exotic organism would maintain the ecosystem integrity for native species. Vegetation communities would be maintained and protected from degradation over the short- and long-term providing sustainable T&E habitat. Improved habitat due to elimination or reduction of exotic invasive species to an acceptable level would be a long-term positive impact.

The control of sericea and other noxious weeds has the potential to indirectly benefit the regal fritillary butterfly, Henslow's sparrow, loggerhead shrike, and prairie mole cricket due mainly to the preservation of native grasses and forbs that would otherwise be displaced by sericea. If, however, herbicide application is conducted in May to July over broad expanses of non-cantonment, many forb species may be killed, resulting in disrupted habitat and short-term indirect impacts to rare that depend on forbs and woody plants for food and habitat. The frequency of herbicide application, the timing when spraying is conducted, and the expanse of area sprayed, are factors that would collectively influence the overall impacts to forbs and woody plants. Potential short-term adverse impacts to the regal fritillary butterfly may occur from the loss of prairie wildflowers, particularly violets (*Viola* species), which serve as host plants needed for reproduction. The prairie mole cricket may be adversely impacted by the loss of native forb and grass species. Aerial spraying of herbicides may adversely impact the Henslow's sparrow by impacting vegetation in preferred nesting areas. The loggerhead shrike may be adversely impacted due to the reduction of insects in areas where forb populations and woody vegetation are diminished.

Under the 2004 IPMP, chemical control is not conducted in riparian habitats occupied by the bald eagle, nor attempted on the banks or on sandbars of the Kansas River. The very low toxicity of the six herbicides to surrogate wildlife bird species suggests that these federally listed bird species would not be impacted. In addition, the relatively low persistence and infrequent use of the herbicide would further reduce the actual exposure of the Topeka shiner and other aquatic species to herbicides. Therefore, the actual exposure of fish to other herbicides would be greatly reduced to non-toxic levels. Pesticide storage on the installation does not affect endangered and other protected species. The two pesticide storage facilities located on the installation are at the

Custer Hill Golf Course and in the DPW maintenance yard. The indirect (chronic) toxicity of herbicides to threatened and endangered species is not anticipated. Estimates for environmental exposure concentrations are below toxicity values established for insects, and birds.

The other methods of pest control currently employed at Fort Riley (i.e., prescribed burns, cultivation, biological control) are not expected to have adverse impact on T&E species because these species are not located in areas where these pest control methods are practiced. Control of nuisance wildlife would not cause adverse impact to T&E species. Control of feral swine would be expected to indirectly benefit T&E species by protecting riparian habitats. Selective removal of animals also may have the effect to reduce disease potential among wildlife populations.

Other pest control functions under the 2004 IPMP such as golf course management, protection of Army property, control of medically important arthropods would not affect T&E species. Activities such as sanitation and hygiene, pest surveillance also would not affect these species.

5.2.3. Cultural Resources

The 2004 IPMP outlines proper pest management in and around the historic buildings that would prevent any structural damage from pests. The 2004 IPMP is consistent with Fort Riley's 2001 ICRMP. In the MPHD and around other historic buildings, indirect beneficial impact would accrue from vegetation control programs that prevent the proliferation of weeds. Historic landscapes would benefit through prevention of loss to ornamental and turf pests. Protection of historic landscapes would protect the aesthetic values and view shed, particularly associated with the MPHD.

Control of pest birds (such as pigeons, starlings and English sparrows) and bats protect historic properties. Birds become pests when populations are highly concentrated in the cantonments areas. Their droppings negatively affect historic limestone buildings because their droppings contain an acid that defaces and accelerates deterioration of outside buildings materials. Nests destroy the infrastructure of historic buildings by blocking air intakes, clogging drainpipes, interfering with awnings, and creating fire hazards in historic buildings.

Many current pest control operations do not normally affect cultural resources. Most management activities such as good housekeeping, putting out traps or baits, pest surveillance, and spraying pesticides do not affect the cultural resources they are performed in and around. Other pest control functions under the 2004 IPMP such as golf course management, protection of Army property, control of medically important arthropods would not affect cultural resources.

5.2.4. Health and Safety

Full implementation of the 2004 IPMP would be expected to produce moderate long and short-term benefits on human health and safety. The 2004 IPMP establishes integrated safety procedures for installation personnel.

Direct adverse impact pertaining to the use of pesticides is not anticipated. At Fort Riley, individuals certified in the handling, mixing, and use of herbicides perform all herbicide applications. Herbicides are handled and applied in accordance with EPA approved labels and MSDS, which specify procedures designed to ensure human health protection. Adherence to basic safety guidelines and the availability and use, if necessary, of personal protective equipment for individuals conducting prescribed burns is expected to minimize the potential for health impact.

Medical surveillance would be used to monitor the health and well-being of government personnel who routinely apply pesticides at Fort Riley (excluding those who apply them through self-help pest control). An initial physical examination would be conducted to determine that the individual is physically capable of wearing a respirator (if required) and to establish a baseline red blood cell cholinesterase level. A physical examination of the same scope as the initial examination would be conducted annually. Additional information concerning medical surveillance can be found within the 2004 IPMP.

Pest controllers are given hazard communication training, to include information about hazardous materials in their workplace. There are MSDS and hazard communication reference points in the Directorate of Environment and Safety Pest Management Facility (DES PMF), and the installation's golf course supervisor's office. MSDS sheets for all pesticides and other toxic substances used in each facility are kept at those locations.

Personal Protective Equipment (PPE), which must be used in accordance with pesticides' label directions and Army regulations, would be provided to Government personnel. Contractors would ensure their employees have required PPE when mixing, applying or otherwise handling pesticides. Pesticide-contaminated protective clothing provided to Government personnel would not be home laundered, but would be laundered at Fort Riley's expense in the DES PMF. Tyvek suits would be laundered twice in the DES PMF pesticide washing machine and disposed as common waste. Personal clothing of government personnel that inadvertently becomes contaminated with pesticides also would be laundered at Fort Riley's expense at the DES PMF, if the label for the contaminating pesticide requires the use of a coverall or similar protective clothing during the use of the pesticide. Personal clothing would be laundered twice and returned to the employee, or disposed as common waste, as appropriate. The post does not launder contractors' clothing. The proper use and maintenance of personal protective equipment can be found in the 2004 IPMP. Other safety issues are discussed in the IPMP.

The AFPMB Technical Guide No. 16, Pesticide Fires: Prevention, Control, and Cleanup, dated June 1981, details pre-fire planning, burning characteristics of pesticides, fire notification procedures, fire fighting tactics, post-fire cleanup and fire prevention. Information from this memorandum and information on first-aid procedures, burning characteristics of various pesticide types, and combustible and flammable liquid definitions are within the 2004 IPMP. The Fort Riley Fire Department is responsible for the preparation of fire plans and incident response for all pesticide fires on Fort Riley.

Indirect adverse impact to human health is not anticipated under the Full Implementation Alternative. Precautions shall be taken during pesticide application to protect the public, both on and off installation facilities. Pesticides are not sprayed outdoors when the wind speed exceeds ten miles per hour or the label maximum wind speed, depending on the type of application and non-target concerns in the immediate area. Whenever pesticides are applied outdoors, care is taken to make sure that any spray drift is kept away from individuals, including the applicator. Unprotected personnel are not permitted in a treatment area during pesticide application if the pesticide label requires PPE. Some pesticides, such as baits, can be used without exposure to people present in the area being treated.

Aerial spraying would not be conducted in cantonments areas. Herbicides would be applied by spraying from vehicles or by personnel using hand-held sprayers. Health protective measures identified in the discussion of direct impact would avoid indirect health impact to humans.

The exposure of unprotected humans who may be sensitive to smoke that has drifted downwind from prescribed burn sites has the potential to cause short-term minor adverse human health impact. Burns that become uncontrolled could adversely affect safety. Uncontrolled burns present a direct risk to people. Smoke across roads could indirect impact safety as a result of impaired driver vision.

5.2.4.1. Protection of Children

Children would be expected to benefit due to enhanced hygiene as a result of the elimination of pests as disease vectors. Children are most vulnerable to vector-borne diseases (carried by insects) because their immune systems are still developing. Thus, reactions can be more severe than with adults. Controlling household pests such as cockroaches and other arthropods such as ticks and mosquitoes would enhance their health and well-being.

Control of nuisance wild animals would be expected to benefit children. Urban coyotes have been documented to attack small children in other locations of the United States. Coyotes have been observed on or near school grounds and childcare facilities at Fort Riley. The removal of these urban coyotes precludes the possibility of bites and attacks on children. Children would be expected to benefit from the removal of other nuisance wild animals, such as red fox that, are reservoirs of zoonotic diseases that may infect children.

Prescribed fires would only be conducted where children are not present. Children would not be exposed to elevated levels of particulates.

Children are more susceptible to the chemical effects of pesticides. Residuals could potentially negatively adversely affect children. If infestations develop near areas occupied or used by children, control strategies would emphasize nonchemical methods first. Herbicide treatment would be a last resort and only products that are non-toxic or low in toxicity to humans would be used. Aerial spraying would not be conducted in cantonment areas.

Compliance with the EPA phase out of chlorpyrifos and continued restrictions on pesticide applications in areas where children are present would not cause disproportionate environmental health risks or safety risks to children from the proposed action and no action alternatives. An analysis pursuant to EO 13045 (Protection of Children from Environmental Health Risks and Safety Risks) is not required.

5.2.4.2. Environmental Justice

The primary concern regarding Environmental Justice and potential effects pertain to disproportionately high and adverse consequences impacting minority and low-income communities. The 2004 IPMP is not expected to create disproportionately high or adverse human health or environmental effects on minorities or low-income populations or communities at or surrounding Fort Riley.

5.2.5. Sociological Environment

5.2.5.1. Socioeconomics

The primary concern regarding potential effects on socioeconomics pertains to changes in population, housing, and economic conditions. No impact to demographics or housing is expected under the Full Implementation alternative.

Moderate positive impact to socioeconomics would be expected under this alternative. Agriculture-related economics would benefit during the long-term due to control of pests that destroy crops and infect livestock. Noxious weed control minimizes damage to crops whereas control of feral swine is critical to protecting the Kansas livestock industry from diseases such as swine brucellosis and pseudorabies. Control of sericea would protect native prairies used for livestock pastures.

5.2.5.2. Stakeholders

The proposed action would be expected to benefit all stakeholders, internal and external. Internal installation stakeholders would benefit through support and accomplishment of the military mission. Soldiers and their families would benefit as a result of control of disease vectors, enhanced hygiene and control of zoonotic diseases. Natural resource management agencies would benefit due to the integration of natural resources management considerations into pest management activities. IPM fosters a cooperative approach to working with these agencies.

No impact would be expected to Native American and other ethnic concerns. Consultation with Native American nations would not be required. Compliance with NAGPRA and the AIRFA would not be applicable.

5.2.5.3. Visual and Aesthetic Values

Full implementation of the 2004 IPMP is anticipated to produce minor beneficial effects to visual and aesthetic values in developed and undeveloped areas of Fort Riley. These values would be protected because long-term integrity of native tall grass prairie as well as the view shed would be protected. Protection of the native ecosystem against invasion and monocultures of noxious weeds such as sericea would protect the aesthetic value of the tall grasses. Prescribed burning may adversely affect visual values immediately after burning but the long-term effect is to maintain the aesthetic value of the tall grass prairie.

The short and long-term aesthetic value of historic features also would benefit. Historic landscapes would be maintained through control of ornamental and turf pests. The façade of historic buildings would be protected through the control of pest birds that produce unsightly droppings. These droppings also chemically deteriorate the façade of the limestone buildings.

5.2.6. Military Mission

Full implementation of the 2004 IPMP would result in moderate beneficial effects for all three attributes of the military mission: Training and Operational Readiness, Quality of Life and Environmental Stewardship. The indirect and direct benefits would be short and long-term. Integrated Pest Management benefits human aspects as well as ecosystem aspects of the military mission.

5.2.6.1. Training and Operational Readiness

Positive impact would be anticipated under the Full Implementation Alternative. Integrated pest management under the Full Implementation Alternative would promote training and operational readiness. This alternative would be expected to protect forces from disruption due to vector-borne diseases and nuisance pests in an environmentally sound manner. This alternative would be expected to minimize risks to humans and the environment.

Army property and infrastructure would be protected under this alternative. Pest management under the Full Implementation Alternative maximizes the service life of materials and equipment and protects against food loss. Pest management of landscaping plants and forest pest management protects these Army properties against loss.

Weed control serves to avert damage to paved areas, buildings, water lines, sewage collection lines, and power lines. Vegetation control along roads protects pavement and increases visibility of roadways for safety. The current practice of prescribed burning is expected to indirectly benefit infrastructure elements by reducing the potential for uncontrolled wildfires, which could destroy buildings or utilities.

Noxious weed control would result in long-term sustainability and resiliency of training lands to provide a platform for realistic training. Noxious weed control minimizes impediments to training by maintaining vegetative communities. The application of integrated practices such as prescribed burning, brush removal and noxious weed control support the integrity of the native tall grass vegetation community. Forest pest management at Fort Riley, under this alternative, would directly sustain a viable and diversified forested training land. Pest management in woodlands would indirectly benefit training through soil and water conservation (including soil erosion control), particularly along riparian corridors, and noise abatement. Vigorous forest and grassland communities reduce erosion of training lands and support realistic military training requirements.

5.2.6.2. Quality of Life

Fort Riley's IPMP would be expected to enhance the well-being and welfare of residents, employees and soldiers. Indirect and direct beneficial effect would be expected during the short and long-term. Public health problems related to pests including painful bites and stings, unsanitary conditions, allergies and asthma, food poisoning, and serious diseases such as encephalitis, rabies, and Lyme disease would be minimized. IPM's emphasis on sanitation and hygiene would indirectly enhance the well-being of individuals associated with Fort Riley.

5.2.6.3. Environmental Stewardship

The 2004 IPMP would have positive short and long-term effects on environmental stewardship. IPM would directly increase environmental protection and enhancement. Environmental protection would be accomplished through overlapping regulatory compliance and inspections. Integration with other installation environmental plans (such as the Integrated Natural Resources Management Plan) produces a holistic approach to environmental stewardship. A critical aspect of IPM is the minimization of impact to the environment through reduced pesticide use.

Environmental Protection and Compliance

Environmental protection is ensured through rigorous compliance to legal requirements. Pest management at Fort Riley is subject to numerous laws, regulations and guidance documents including: ten Federal laws and regulations, three Kansas laws, five EOs and Presidential Memoranda, 27 ARs, Military Standards and DoDI, two MOU between Fort Riley and the Kansas Department of Agriculture; and 33 military technical guides and publications. The DoD in general, and the Fort Riley installation specifically, are legally obligated to follow all applicable environmental regulations while conducting activities under the 2004 IPMP.

The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) is of particular relevance to pest management at Fort Riley. FIFRA establishes regulations for proper registration and use of

pesticides. The registration process, as promulgated under the EPA, ensures that a determination was made of the safe usage of a chemical in a particular application. Pursuant to FIFRA, no manufacturer may make or sell a product for use to control pests unless the compound is registered with the EPA. It is unlawful to use any registered pesticide in a manner inconsistent with its labeling. It also is unlawful to use any product as a pesticide if it hasn't been registered with the EPA for that use. Other Federal laws relate to worker safety, procedures for safe use and storage of pesticides, and the protection of land and water when pesticides are used and stored.

Three different Compliance Inspections Systems review the Pest Management Program. The first is the Environmental Program Assessment System (EPAS). The EPAS was formerly known as the Environmental Compliance Assessment System. The EPAS is a method the Army uses for self-assessment of its compliance with environmental laws and other requirements. The intention of EPAS is to identify and correct violations of laws and regulations and ensure that the Army maintains proper environmental stewardship. Fort Riley has implemented a self-assessment inspection system through its Environmental Compliance Management Plan (ECMP). The intent of the ECMP is to ensure compliance with the Commanding General's Policy (14-6), Fort Riley Environmental and Safety Management Policy. Section 7 of the ECMP identifies the compliance standards for pesticide handling and distribution facilities. The DES PMF is self-inspected weekly for environmental compliance by the DES Pest Controller.

Periodic inspections by other agencies of the DES PMF occur on an infrequent basis. The U.S. Army Environmental Center, Command Consultant, provided an evaluation of the facility shortly after its completion in 1995. The EPA inspected the facility and the operational program in 1995. In both evaluations, only positive Findings were given for the facility and operation of the program.

Control of nuisance wildlife is conducted according to state and federal law pertaining to the "taking" of wildlife. The take of nuisance wildlife for the purpose of animal damage control is conducted under one Federal permit and two state permits. The Federal permit is a "Special Purpose" permit. This Federal permit allows the take of migratory birds (except bald and golden eagles and threatened and endangered species). The permit also authorizes retrieval and possession of injured migratory birds including eagles. A state-issued "Nuisance Animal Damage Control Permit" is retained for the control of furbearers, coyotes, and pigeons, starlings and house sparrows, small game, nongame animals, reptiles and amphibians, and invertebrates. Fort Riley also possesses a State of Kansas Scientific, Education or Exhibition Wildlife Permit.

Pest management also complies with EO 11978 (*Exotic Organisms*) by controlling pests such as sericea and feral swine. No state or federal permits are necessary for the control of feral swine.

Environmental Enhancement

Environmental enhancement would include management of native biodiversity and protection of ecosystem integrity to meet the public mandate and Army Policy for Environmental Stewardship as part of the military mission. One of the critical elements of environmental stewardship pertaining to the 2004 IPMP is biodiversity conservation. Conserving biodiversity results in ecosystem integrity and, thus, sustainable training lands. Control of exotic organisms that invade native ecosystems is critical to maintaining ecosystem integrity. Control of sericea and feral swine are examples of activities that directly enhance the environment.

Integration with Other Environmental Management Programs

The installation's pest management program, as outlined in the 2004 IPMP, complies with the Fort Riley Pollution Prevention Plan and Executive Order 12856 of August 3, 1993, Federal Compliance With Right-to-Know Laws and other relevant pollution prevention requirements. Other Fort Riley plans that support the proper management of herbicides include the Installation Spill Contingency Plan, Storm Water Pollution Prevention Plan, Wellhead Protection Plan and the Spill Prevention, Control and Countermeasures Plan. In combination, these plans provide effective and safe management of hazardous and toxic substances at Fort Riley. The control of pests with pesticides is only one part of an overall IPM strategy that stresses nonchemical controls when such controls are practical.

A pesticide spill cleanup kit is maintained wherever pesticides are stored or used. A spill cleanup kit also is kept on each pest control vehicle used by government and contracted pesticide applicators.

Natural and cultural resources management programs would be integrated with the pest management program on Fort Riley. Integration would include the continued adherence to Fort Riley's INRMP, ESMP and the ICRMP. The INRMP is designed to provide cooperative and complimentary use of the improved grounds and ranges, and the existing diverse fish, wildlife and plant habitats present on the installation, and protection and enhancement of threatened and endangered species. This plan, and continued coordination with the USDOI and the KDWP, would guide ongoing management actions. The ICRMP is designed to provide the use of training lands while providing protection for eligible or potentially eligible cultural resources.

Integrated pest management is a comprehensive approach to pest management that considers various chemical, physical, and biological suppression techniques, the habitat of the pest, and the interrelationship between pest populations and their environment. This ecosystem approach to an installation or military service pest management program requires coordination with the natural resources management program. Conversely, management of the natural environment for fish and wildlife, forestry, outdoor recreation, grounds maintenance, agricultural outleasing, wetlands, endangered species protection and soil/water conservation requires coordination with the pest management program. Neither integrated pest management nor other aspects of integrated natural resources management can fully succeed in serving the best interests of an installation without this coordination.

Some specific examples on Fort Riley in which pest management is integrated with natural resources management are:

- Wildlife damage management.
- Pest management requirements in aquatic, riparian, and wetland environments.
- Identification of potential conflicts between threatened and endangered species and pest management actions.
- Integration of pest management considerations with natural resources program responsibilities regarding vegetation management, forest insect and disease damage, and pest damage to ornamental.
- Coordination with Fort Riley natural resources managers regarding approval and use of pesticides for vegetation management and other natural resources program.

- Coordination with Fort Riley natural resources managers regarding approval and use of pesticide application equipment for vegetation management and other natural resources programs.

Another critical element of the 2004 IPMP is environmental awareness and education of soldiers, their families and employees.

5.3. Effects of No Action Alternative

The installation would not implement the 2004 IPMP that combines various means of control to reduce pesticide applications. This alternative is anticipated to yield minor to moderate adverse effects to all six environmental areas (Table 5.2). Therefore, implementation of the No Action Alternative is not favored. This alternative would not take into account natural resources management, socioeconomics and military considerations. This conflicts with DoD and DA requirements to develop and execute an integrated approach.

Table 5.2 Anticipated Effects of the No Action Alternative

	Direct Effects	Indirect Effects	Short-Term Effects	Long-Term Effects
Land Use	O	_	O	_
Natural Resources				
Soils	_	_	_	_
Water	O	_	_	_
Air	_	O	_	O
Native Biodiversity	_	_	_	_
Cultural Resources	O	_	_	_
Health and Safety	O	_	O	_
Environmental Justice	O	_	O	_
Impact on Children	_	_	_	_
Sociological Environment				
Socioeconomics	_	_	_	_
Stakeholders	_	_	_	_
Visual Values	O	_	O	_
Military Mission				
Training and Operational Readiness	_	_	_	_
Quality of Life	O	_	_	_
Environmental Stewardship	_	_	_	_

Impact expected: (+) positive (-) negative (0) none

There would be no formal, integrated management plan for pest control. There would be no established set of SOP's, or centralized set of rules and procedures. The absence of a formal set of management measures would inhibit the installation's ability to adequately engage in future strategic pest management planning and new initiatives. It would not capture benefits derived from identifying and executing comprehensive, integrated pest management actions.

This alternative would result in tangible risks to the military mission. Less effective protection of infrastructure, equipment, and food would result. The well-being and morale of soldiers, families and employees would be eroded as a result of less effective control of disease vectors and nuisance pests. It is anticipated that humans would be exposed to a greater risk of diseases. The reliance on pesticides would result in greater exposure of humans and the environment to pesticides.

5.3.1. Land Use

No direct effects on land use are anticipated under the No Action alternative. However, minor indirect adverse impact to land use would be expected during the long-term. Failure to implement certain integrated pest control under the IPMP eventually would result in minor functional degradation of training lands to support military training. Vegetation control that would not take into account protection of natural resources would erode native vegetation communities that maintain resiliency of the land to support military training. The lack of IPM to control turf and ornamental pests would adversely affect recreational use of land such as the golf course and playing fields. These minor to moderate negative effects would occur during the long-term. Increased damage to recreational areas would increase the costs of maintaining these areas. Thus, patterns of land use at Fort Riley may be adversely affected indirectly over the long-term. Other pest control activities such as nuisance wild animal control, forest pest control and control of stored food products would not affect land use directly or indirectly.

5.3.2. Natural Resources

Both abiotic and biotic resources would be negatively affected directly and indirectly. Short-term impact would be expected related to exposure of natural resources to greater amounts and more frequent applications of pesticides. Long-term impact also would be expected as a result of reduced ecosystem integrity. The loss of ecosystem integrity and balance would then promote the more extensive invasion of pest species because ecological imbalances tend to favor exotic organisms.

5.3.2.1. Soils

Minor direct impact to soils is anticipated. Most of the impact is related to herbicide spraying for vegetation control at ranges, and noxious and/or exotic weed control. More frequent applications of pesticides in higher amounts would increase the amount of pesticide residuals in soils. The effects would occur over the short- and long-term. Turf pest control would further increase soil residuals.

Long-term, minor to moderate adverse indirect impact would be expected as a result of increased erosion. Greater reliance of herbicides would reduce permanent vegetative cover and thus, increase the amount and rate of soil erosion. Less effective noxious weed control also would indirectly increase erosion. Noxious weeds tend to be colonizers that do not provide extensive soil cover.

It is anticipated that erosion would be the greatest on the eastern side of the installation. This is due to three factors: rates of infestation of sericea; susceptibility of the soils to erosion; and topography. Rates of sericea infestation range from light to heavy (Figure 4.5). The soils are Clime-Sogn, Benfield-Florence and Smolan-Geary associations, which are susceptible to moderate to severe erosion. Lastly, the topography is steep and sloping.

Prescribed burning, which produces short-term soil exposure, would be expected to compound the soil erosion resulting indirectly from herbicide spraying. Other pest control activities such as nuisance wild animal control, forest pest control and control of stored food products would not affect soils.

5.3.2.2. Water

Direct adverse impact to water resources under the No Action Alternative is not anticipated. The direct application of herbicides to surface water is not anticipated because herbicides, which are labeled for use on-land, are seldom, if ever, labeled for treatment of aquatic plants. Most herbicide labels reviewed specifically caution applicators to avoid spraying herbicides on surface waters (includes wetlands).

Minor to moderate adverse indirect impact would be expected during the short and long-term. Greater reliance of pesticides would increase the potential for inadvertent contamination of surface and ground water and wetlands. Pesticides would be applied in greater amounts and more frequently to control pests. Adverse impact is anticipated from potential accidental drift of herbicides to surface waters when herbicides are applied from aircraft. Even when best management practices are employed, accidental drift of herbicides away from the spray area may occur.

Less effective noxious and invasive plant control would degrade long-term ecosystem integrity. Adverse effect to water quality would be expected as a result of degradation of ecosystem integrity. Loss of integrity would be expected to be greatest in areas where water resources and sericea coincide. For example, medium infestations of sericea have been identified in proximity to three major perennial streams on Fort Riley: Wildcat, Little Arkansas and Wind creeks.

These creeks also were identified as areas of feral swine habitation. Feral swine destroy the integrity of creeks and other bodies of water by rooting and wallowing which increases turbidity and streambank erosion. Less effective control of feral swine along these creeks would compound sericea infestations.

5.3.2.3. Air Quality

Minor, direct impact to air quality is anticipated under the No Action alternative. Incidental releases of pesticides into the air would become more frequent. This would be compounded by smoke from prescribed burning during the spring. However, both of these activities are not continuous sources of emissions. Thus, the impacts would be temporary and not expected to exceed air emission standards.

5.3.2.4. Native Biodiversity

It is expected that native biodiversity would be adversely affected under the No Action alternative. Considerations to protect and maintain native plant and animal communities would not be integrated into pest control activities. A greater reliance of chemical applications would negatively affect plant and animal communities. Most of the effect would pertain to vegetation

control on ranges and noxious and/or exotic plant control. T&E species would not be affected because legal protections would remain in effect.

Flora

Direct short-term and long-term negative effect to native plant communities would be expected as a result of greater reliance on herbicide applications. The forb (broad leaf plants) component of native plant communities would be reduced and would result in reduced plant species diversity. The forb component would be killed immediately following spraying. More frequent applications would produce long-term and direct adverse effects.

Indirect adverse effect is anticipated over the long-term. The health and condition of the plant communities on Fort Riley would not be maintained or protected. Pest management priorities would not take into account effects to native biodiversity. Management measures such as prescribed burning would not take into account the impacts on woodlands and riparian edges. Plant community quality and complexity would be reduced.

Another indirect adverse impact to native plant resources is anticipated due to the unchecked proliferation of sericea at the current level of control. This noxious weed displaces native prairie grass and forb species and produces monocultures in areas of high infestation (Eddy, 1998). It is anticipated that noxious and/or exotic plant communities would succeed native tall grass communities.

Less effective control of other exotic organisms such as feral swine would indirectly impact native plant communities. Feral swine root and destroy native vegetation, particularly along riparian corridors.

Fauna

Direct adverse effects to native animal communities would not be expected. Greater applications of pesticides would not be expected to produce toxic effects in animals. Activities such as nuisance animal and wildlife damage control would not affect populations of native species.

Moderate indirect adverse effects would be expected to occur during both the short- and long-term. Pest management affects fish and wildlife on Fort Riley primarily through changes in habitat. There would be no integrated plan, under the No Action Alternative, to minimize pesticide applications and improve and maintain both terrestrial and aquatic habitat conditions and diversity. Another indirect effect of less effective control of exotic plant species is that large, monotypic stands eliminate natural foods and cover essential to many wildlife species. The long-term result is the potential loss of native animal diversity.

Threatened and Endangered Species

No direct or indirect adverse impact on any state or federally listed T&E species is expected. Legal compliance with the Federal ESA and the Kansas Nongame and Endangered Species Conservation Act would be required under the No Action alternative. Pesticides would not be applied to threatened and endangered species habitat nor would be applied to areas where species are present and possibly would be exposed to inadvertent drift. Neither of the two certified storage facilities for pesticides is located near or within T&E habitat.

5.3.3. Cultural Resources

No direct negative effect to cultural resources is expected. It is anticipated that cultural resources would be indirectly affected as a result of less effective pest control. Historic buildings, landscapes and viewshed would be those cultural resources affected. It is not expected that archeological resources would be affected.

Indirect adverse effects to historic buildings, during both the short- and long-term, would occur as a result of less effective protection from pest-related damage. In particular, real property related pests such as termites would be less effectively controlled and could potentially damage historic buildings and components of buildings. Historic facades and monuments would potentially suffer damage as a result of bird droppings at sites where roosts are not controlled. In the MPHD and around other historic buildings, indirect adverse impact would result from less effective vegetation control programs. Greater proliferation of vegetation that degrades foundations and infrastructure would be anticipated. Historic landscapes would be adversely affected as a result of less effective control of ornamental and turf pests. The degradation of historic landscapes would reduce the aesthetic values and view shed, particularly associated with the MPHD.

5.3.4. Health and Safety

No direct adverse effects would be expected to health and safety under the No Action Alternative. Health and safety measures in place for the Full Implementation alternative would continue under the No Action alternative action. These measures are: 1) maintenance of a list of sensitive individuals, 2) avoidance of pesticide treatment in patient areas at Irwin Army Hospital and areas with infants, and 3) proper use of protective equipment by pest management technicians in conjunction with medical surveillance. In addition, most outdoor spraying operations for the proposed action or no action alternative are conducted during early morning hours which avoids most pedestrian, automotive and juvenile traffic, thus reducing the possibility of health and safety impacts. Adherence to these measures would reduce the chance of exposure to pesticides, avoid detrimental health effects, and would result in no significant impacts to human health and safety from the No Action alternative.

Indirect long-term negative effect would be expected. The negative effective would be a less effective means for managing health hazards. This could potential indirectly affect health and safety.

5.3.4.1. Protection of Children

Adverse moderate direct and indirect impact on children would be expected under this alternative. The greater reliance on chemical control would be expected to produce greater likelihood of children being directly exposed to pesticides. Their physiological development makes them more susceptible to chemical residues and adverse health effects. Also, direct exposure to vector borne diseases would be expected. Indirect effects such as greater exposure to disease as a result of reduced hygiene and sanitation would be expected.

More frequent contact with nuisance wildlife would be expected as a result of the No Action alternative. Direct adverse impacts would include injuries from bites and scratches. Indirect impacts would include greater likelihood of exposure to zoonotic diseases and parasites.

5.3.4.2. Environmental Justice

Indirect, minor adverse impact during the long-term would be expected under the No Action alternative. Any negative effect could potentially disproportionately affect low income and minority populations because Fort Riley and adjacent Geary County are considered Environmental Justice areas. Negative effect to well-being of individuals would be expected as a result of less effective pest control and the more wide-spread application of pesticides.

5.3.5. Sociological Environment

5.3.5.1. Socioeconomics

It is anticipated that socioeconomics would be negatively affected. The impact would be direct and indirect and occur during both the short- and long-term. Moderate adverse effect would relate to the agriculture industry on Agriculture Outlease land and neighboring farms.

Less effective noxious weed control would be expected to directly affect crop yields in outleased lands and neighboring farms. This effect would be moderate in magnitude. It is anticipated that hay leases would be negatively impacted by the spread of noxious weeds. Grass yields would be reduced and leases may have to be curtailed to prevent the spread of noxious weed seeds as a result of moving hay off of Fort Riley. Less effective control of sericea could result in the spread of this noxious weed to neighboring pastureland. Thus, grazing capacities would be reduced off-post.

Less effective control of feral animals and nuisance wildlife would potentially indirectly affect the livestock industry surrounding Fort Riley. In particular, less effective feral swine control would be expected to result in expanding populations that could become a reservoir of disease such as brucellosis and pseudorabies. These diseases could spread during the long-term to neighboring swine operations. Potential adverse economic effect could be substantial.

5.3.5.2. Stakeholders

Internal and external stakeholders would be negatively impacted under this alternative. The morale and well being of internal stakeholders would be negatively affected in long and short-term. This moderate effect would be direct and indirect. The lack of a collaborative process with external stakeholders such as the KFS, USFWS and KDWP would be a moderate negative effect of this alternative.

No impact would be expected to Native American and other ethnic concerns. Consultation with Native American nations would not be required. Compliance with NAGPRA and the AIRFA would not be expected.

5.3.5.3. Visual and Aesthetic Values

Minor negative impact to visual and aesthetic values would be expected. These effects would be indirect and occur over the long-term. The visual appeal of native tall grass prairies would be replaced by monocultures of sericea in some areas. The visual appeal of historic landscapes and buildings would erode as a result of unwanted vegetation and bat and bird droppings. Loss of visual appeal of historic landscapes would be moderate in magnitude.

5.3.6. Military Mission

5.3.6.1. Training and Operational Readiness

Direct and indirect moderate adverse impact to training and operational readiness would be expected. Impact would occur during both the short- and long-term. Training and operational readiness would be degraded under the No Action alternative because less effective pest control would be expected to result in greater exposure to disease, loss of equipment, infrastructure, and food to structural pests and rodents. The greater reliance of chemical application would require greater expenditures of installation funds. These funds could potentially reduce available funding for training and operations.

5.3.6.2. Quality of Life

Well-being and morale as a reflection of Quality of Life would erode under this alternative. The anticipated moderate effects would be both direct and indirect. Impact would occur during the short-term because insect populations can rebound quickly after effective control is reduced. Long-term effects would be expected as populations of pests continue to multiply over a period of years.

Nuisance pests such as wasps would not be controlled as effectively. Medically important arthropods such as mosquitoes would not be as effectively controlled under this alternative. Less effective control of other disease carrying pests such as birds and bats would result. Good housekeeping practices and household sanitation would not be emphasized as greatly under the No Action alternative. Thus, household pests and pests of stored food products may become more abundant in housing and dining areas.

5.3.6.3. Environmental Stewardship

Moderate adverse effects, overall, to the installation's Environmental Stewardship would be anticipated. Environmental stewardship goals and practices would not be effectively accomplished under the No Action alternative. The stewardship goal of Fort Riley's pest management program to maintain ecosystem health and integrity while supporting military training and Quality of Life would be adversely affected. The negative effects would indirect and occur over both the short- and long-term.

Environmental Protection and Compliance

Direct or indirect adverse impact would be expected under the No Action alternative. Certain environmental compliance standards would not be met under this alternative. The lack of effective control of sericea in non-cantonment areas under this alternative may place Fort Riley at risk of violating the Kansas Noxious Weed Law. This alternative also would violate DA and DoD guidance to develop and execute an Installation Pest Management Plan that incorporates integrated pest management. Environmental compliance planning through integration with various plans would not be conducted.

Other environmental protection and compliance requirements pertaining to pesticide labeling, handling and usage would remain in effect regardless of whether or not the IPMP is implemented. Legal requirements would be met under the No Action alternative.

Environmental Enhancement

Indirect impact during the long-term would be expected under the No Action alternative. There would be no benefits related to environmental enhancement. Pest management would be conducted primarily for vector and disease control and real property protection. The enhancement of environmental integrity would not be an element of overall IPM approach.

Pest species and noxious/exotic organisms may become more abundant as a result of ecosystem perturbations from military training. Also, pesticide resistance would be expected to increase as greater reliance on chemicals occurs.

Integration with Other Environmental Programs

Indirect adverse impact is anticipated under this alternative. Impact could potentially occur during both the short- and long-term. No direct impact is expected. Full integration with other environmental programs would not be realized. Fragmentation and separation from other natural and cultural resources programs would result.

5.4. Cumulative Effects

A cumulative effect is defined as an effect on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place locally or regionally over a period of time.

5.4.1. Full Implementation Alternative

Full implementation of the 2004 IPMP would result in a comprehensive pest management strategy for Fort Riley that represents environmental compliance and protection, restoration, human welfare, and protection of Army property. The 2004 IPMP would improve existing approaches for pest management on Fort Riley; and meet legal and policy requirements consistent with accepted pest management philosophies. Implementation would be expected to have cumulative beneficial effects to natural resources as well as the sociological environment and the military mission. Adoption of the proposed action would enable Fort Riley to achieve its goals of protecting its soldiers, residents and employees while maintaining operational and training efficiency.

Treatment of noxious weeds with herbicides at application rates identified in the 2004 IPMP is not expected to result in acute or chronic toxicity to aquatic and terrestrial animals, including T&E and rare species at Fort Riley. The operational guidelines specified under this alternative are expected to avoid cumulative impacts to native plants and animals in rangeland areas of Fort Riley. When using aerial spraying to control sericea under this alternative, minimal impact to non-target native species is expected by spraying herbicides in late September when many native forbs are dormant and therefore not greatly affected by herbicides.

Cumulative beneficial impact on land use and infrastructure in the cantonment would be realized under the 2004 IPMP. Equipment, food and people would be more effectively protected. The cumulative effect of this protection is enhanced military readiness and Quality of Life. The cumulative effect of applying integrated control methods, planning with other environmental programs and legal compliance is to enhance environmental stewardship.

5.4.2. No Action Alternative

Cumulative moderate, adverse impact of this alternative would be expected. The absence of formal, integrated pest management would be expected to gradually erode natural resources and the military mission, in particular. Noxious weeds would not be controlled to the optimal extent. Negative cumulative effects to socioeconomics also would be expected.

Cumulative adverse impact under the No Action Alternative is expected to result from less than optimal control of the noxious weeds, particularly sericea, which currently infests over 30,000 acres in the non-cantonment at Fort Riley. The gradual proliferation of sericea would erode the diversity of native grasses and forbs in broad expanses of the non-cantonment. The spread of noxious weeds would negatively affect terrestrial wildlife and the entire floral community.

Long-term indirect adverse economic impacts are anticipated to owners of agricultural lands surrounding Fort Riley. More money would have to be spent by off-post landowners if ineffective noxious weed control programs are used on-post. In addition, the spread of noxious weeds would reduce yield of crops and therefore affect farming income. Less effective control of feral swine would compound this negative effective because swine are reservoirs of disease that could negatively affect off-post hog operations.

Certain environmental compliance standards would not be met under this alternative. The lack of effective control of sericea in non-cantonment areas under this alternative may place Fort Riley at risk of violating the Kansas Noxious Weed Law. This alternative also would violate DA and DoD guidance to develop and execute an IPMP that incorporates integrated pest management. Environmental compliance planning through integration with various plans would not be conducted.

6.0 CONCLUSION

This EA was conducted in compliance with the NEPA CEQ Regulations, 40 CFR 1500 et seq., and Chapter 5, AR 200-2 (*Environmental Effects of Army Actions*). The results of this environmental assessment indicate the following conclusions:

The proposed action is consistent with the goals of the Army's pest management program to maintain ecosystem viability and ensure sustainability of desired military training area conditions; to maintain, protect and improve ecological integrity; to protect and enhance biological communities, particularly sensitive, rare, threatened and endangered species; to protect ecosystems and their components from unacceptable damage or degradation; and to identify and restore degraded habitats. The management measures recommended in Fort Riley's IPMP, if implemented, would directly and positively affect the health and condition of natural resources at Fort Riley.

Full implementation of the 2004 IPMP is anticipated to have positive effects to all six major environmental areas: land use, natural resources and cultural resources, human health and safety, sociological environment and military training. Beneficial effects would occur for all major attributes of these six areas. Therefore, this is the preferred alternative.

The environmental conditions at Fort Riley would not be expected to benefit from the pest management measures associated with No Action Alternative. The absence of a formal set of management measures inhibits the installation's ability to adequately engage in future strategic

planning and new initiatives. It would not capture benefits derived from identifying and executing comprehensive, integrated environmental and natural resources management actions. Also, there would be no formal set of goals and objectives established for each natural resources management program that explicitly guides natural resources management.

The No Action Alternative is anticipated to yield minor to moderate adverse effects to all six environmental areas. Most natural resources attributes would be adversely affected as well as cultural resources. Fewer attributes of the socioeconomic environment would be adversely affected than the natural resources. The No Action Alternative would result in moderate adverse effects to all three attributes of the military mission. Therefore, implementation of the No Action Alternative is not favored.

No significant environmental effects are expected under the Full Implementation Alternative and preparation of and Environmental Impact Statement is not required. Therefore, a Finding of No Significant Impact (FNSI) and a Notice of Availability (NOA) have been prepared for this action.

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ACHP	Advisory Council on Historic Preservation
AIRFA	American Indian Religious Freedom Act
AQCRs	Air Quality Control Regions
AR	Army Regulation
CA	Comprehensive Agreement
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Environmental Regulations
COE	Corps of Engineers
DA	Department of the Army
DES	Directorate of Environment and Safety
DoD	Department of Defense
DoDI	Department of Defense Instruction
EA	Environmental Assessment
ECAS	Environmental Compliance Assessment System
ECMP	Environmental Compliance Management Plan
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESMP	Endangered Species Management Plan
FFEJEI	Environmental Justice Enforcement Initiative
FNSI	Finding of No Significant Impact
FFEO	Federal Facilities Enforcement Office
FORSCOM	Forces Command

FR	Federal Register
GIS	Geographic Information System
INRMP	Integrated Natural Resources Management Plan
IPM	Integrated Pest Management
IPMC	Integrated Pest Management Coordinator
IPMP	Integrated Pest Management Plan
IFWG	Interagency Federal Working Group
ITAM	Integrated Training Area Management
KBS	Kansas Biological Survey
KDHE	Kansas Department for Health and the Environment
KDWP	Kansas Department of Wildlife and Parks
KFS	Kansas Forest Service
KSU	Kansas State University
MAAF	Marshall Army Air Field
MSDS	Material Safety Data Sheet
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPL	National Priorities List
NRHP	National Register of Historic Places
PA	Programmatic Agreement
PMO	Provost Marshal Office
ROI	Region Of Influence
SHPO	State Historic Preservation Office
SINC	Species In Need of Conservation
SOC	Species of Concern
SOP	Standard Operating Procedure
USFWS	United States Fish and Wildlife Service
T&E	Threatened and Endangered Species
TRI	Toxic Release Inventory
WSSA	Weed Science Society of America

APPENDIX A. LEGAL GUIDANCE

Federal and State Laws

1. The Federal Insecticide, Fungicide and Rodenticide Act (through PL 100-460, 100-464 to 100-526, and 100-532).

2. Title 29, Code of Federal Regulations, 1997 revision, Section 1910, Occupational Safety and Health Standards.

3. Title 40, Code of Federal Regulations, 1997 revision, Section 152-186, Recommended Procedures and Criteria for Storage of Pesticides and Pesticide Containers.

4. Public Law 93-629 Section 15/Act, amended, Federal Noxious Weed Law, 1990.

5. 40 CFR 116. Designation of Hazardous Substances.

6. 40 CFR 117, Clean Water Act.

7. 40 CFR 260-261, Resource Conservation Recovery Act.

8. 40 CFR 300, Comprehensive Environmental Response Compensation and Liability Act.

9. 40 CFR 702-704, Toxic Substance Control Act.

10. 40 CFR 1510, CEQ, National Oil and Hazardous Substances Pollution Contingency Plan.

11. Kansas Pesticide Laws, KSA., 1977 supp. 2 - 2467A.

12. Kansas Noxious Weeds Law, KSA., Article 13 Chapter 2-1314 to KSA 2-1332, 1991.

Army Regulations

1. AR 11-34, The Army Respiratory Protection Program, 15 February 1990.

2. AR 40-5, Preventive Medicine, 15 October 1990.

3. AR 40-574, Aerial Dispersal of Pesticides, 26 April 1976.

4. AR 190-13, Physical Security Program, 23 August 1974.

5. AR-51, Security of Army Property at Unit and Installation Level, 1 August 1978.

6. AR 200-1. Environmental Protection and Enhancement, 21 February 1997.

7. AR 200-2 Title 32, Environmental Effects of Army Actions, 23 December 1988.

8. AR 385-10, The Army Safety Program, 23 May 1988.

9. AR 385-32, Protective Clothing and Equipment, 31 October 1985.

10. AR 385-40, Accident Reporting and Records, 1 November 1994.

11. AR 420-47, Solid and Hazardous Waste Management, 1 June 1985.

12. AR 420-76, Pest Management, 3 June 1986.

13. AR 600-50, Standards of Conduct for Department of Army Personnel.

14. AR 750-20, Prevention, Control, and Abatement of Pollution from Mobile Equipment.

15. BM 385-1-1, Section 19, Safety and Health Requirements, October 1987.

16. MIL-STD-903C, Sanitary Standards for Commissaries, 20 November 1986.

17. MIL-STD-904A, Guidelines for Detection, Evaluation, and Prevention of Pest Infestation of Subsistence, 13 January 1984.

18. MIL-STD-909, Sanitation Standards for Food Storage Facilities, 31 August 1989.

19. HSC Reg 40-30, HSC Operating Program - Preventive Medicine Guidelines for Implementation of a Preventive Medicine Program for MEDCEN/MEDDAC, 16 March 1989.

20. HSC Pam 40-3, October 1985, Environmental Health Program.

Fort Riley Regulation

1. FR 420-16, Generation, Treatment, Storage, and Disposal of Hazardous Waste, 8 April 1982.

Technical Manuals and Publications

1. TM 5-629, Weed Control and Plant Growth Regulation, 24 May 1989.

2. TM 5-630, Natural Resources, Land Management, July 1982.

3. TM 5-631, Natural Resources, Forest Management, December 1981

4. TM 5-632, Military Entomology Operational Handbook, December 1971.

5. TM 5-633, Natural Resources, Fish and Wildlife Management, February 1982.

6. TM 5-635, Natural Resources, Outdoor Recreation and Cultural Values, February, 1982

7. Armed Forces Pest Management Board Technical Information Memorandum No. 14, Protective Equipment for Pest Control Personnel, 1978.

8. Armed Forces Pest Management Board Technical Information Memorandum No. 15, Pesticide Spill Prevention Management, September 1980.

9. Armed Forces Pest Management Board Technical Information Memorandum No. 16, Pesticide Fires: Prevention, Control, and Clean-up, January 1981.

10. Armed Forces Pest Management Board Technical Information Memorandum No. 17, Pest Control Facilities, November 1983.

11. Armed Forces Pest Management Board Technical Information Memorandum No. 21, Pesticide Disposal Guide for Pest Control Shops, October 1986.

12. USAEHA Technical Guide 114, Guide to the Medical Surveillance of Pest Controllers, March 1976.

13. USAEHA Technical Guide 138, Commensal Rodent Control.

14. DoD Directive 4150.7, Department of Defense Pest Management Program, 22 April 1996.

15. DoD Certification, DoD Plan for the Certification of Pesticide Applicators.

16. Army Pamphlet 420-7, Natural Resources-Land, Forest, and Wildlife Management, 30 June 1986.

APPENDIX B: Common and Scientific Names of Plants Found on Fort Riley

Common Name	Scientific Name
Forbs	
Agrimony	Agrimonia parviflora
Alfalfa	Medicago sativa
Allegheny Blackberry	Rubus alleghensis
American bellflower	Campanula americana
American Germander	Teucrium canadense
Annual Broomweed	Amphiachyris dracunculoides
Annual Erigonium	Eriogonum annuum
Annual fleabane	Erigeron annuus
Antelopehorn Milkweed	Asclepias viridis
Aromatic Aster	Aster oblongifolius
Arrowhead or Wapato	Sagittaria latifolia
Beggar's Lice or Tick Trefoil	Desmodium glutinosum
Bigflower Coreopsis	Coreopsis grandiflora
Birds-foot Trefoil	Lotus corniculatus
Black Medic	Medicago lupulina
Black Sampson	Echinacea angustifolia
Black Snakeroot	Sanicula gregaria
Black-eyed Susan	Rudbeckia hirta
Blazing Star	Liatris punctata
Blue Wild Indigo	Baptisia minor
Blunt-leaf Spurge	Euphorbia spathulata
Bracted Spiderwort	Tradescantia bracteata
Brown-eyed Susan	Rudbeckia triloba
Buckhorn Plantago	Plantago aristata
Buffalo-bur Nightshade	Solanum rostratum
Burhead	Echinodorus rostratus
Butterfly Milkweed	Asclepias tuberosa
Button Blazing Star	Liatris aspera

Common Name	Scientific Name
California Loosestrife	Lythrum californicum
Camphorweed	Heterotheca subaxillaris
Canada Milkvetch	Astragalus canadensis
Canada Wood Nettle	Laportea canadensis
Canadian Blacksnakeroot	Sanicula canadensis
Cardinal Flower	Lobelia cardinalis
Carolina Geranium	Geranium carolinianum
Carolina Horsenettle	Solanum carolinense
Carpetweed	Mollugo verticillata
Carrotleaf lomatium	Lomatium foeniculaceum
Catchweed Bedstraw	Galium aparine
Catnip	Nepeta cataria
Cat'sclaw Sensitive Brier	Schrankia nuttallii
Cattail	Typha latifolia
Chickweed	Stellaria media
Clear weed	Pilea pumila
Climbing False Buckwheat	Polygonum scandens
Cobaea Penstemon	Penstemon cobaea
Common Dandelion	Taraxacum laevigatum
Common Dayflower	Commelina communis
Common Evening Primrose	Oenothera biennis
Common Garden Asparagus	Asparagus officinalis
Common Milkweed	Asclepias syriaca
Common Ragweed	Ambrosia artemisiifolia
Common Sunflower	Helianthus annuus
Compass Plant	Silphium laciniatum
Crown Beard	Verbesina
Crown Vetch	Coronilla varia
Cup Rosinweed	Silphium perfoliatum
Curly Dock	Rumex crispus

Common Name	Scientific Name
Curlycup Gumweed	Grindelia squarrosa
Cutleaf Evening Primrose	Oenothera laciniata
Daisy Fleabane	Erigeron strigosus
Dakota Mock Vervain	Verbena ambrosiifolia
Dakota Verbena	Verbena bipinnatifida
Dame's Rocket	Hesperis matronalis
Deptford Pink	Dianthus armeria
Dill	Spermolepis inermis
Drummond Aster	Aster drummondii
Dwarf Dandelion	Krigia oppositifolia
Ellisia	Ellisia nyctelea
Equisetum	Equisetum hymale
Erect Dayflower	Commelina erecta
False Boneset	Kuhnia eupatoriodes
False Dandelion	Agoseris glauca
False Nettle	Boehmeria cylindrica
Fettid Marigold	Dyssodia papposa
Fewflower Ticktrefoil	Desmodium pauciflora
Field Bindweed	Convolvulus arvensis
Field Pennycress	Thlaspi arvense
Field Pussytoes	Antenneria neglecta
Fire Weed, Summer cypress	Epilobium angustifolium
Flannel Mullein	Verbascum thapsus
Florida Lettuce	Lactuca floridana
Flower of an hour	Hibiscus trionum
Flowering Spurge	Euphorbia corollata
Forget-Me-Not	Myosotis verna
Fringe Leaf Ruellia	Ruellia humilis
Garlic Mustard	Alliaria petiolata
Gayfeather	Liatris mucronata

Common Name	Scientific Name
Giant Ragweed	Ambrosia trifida
Goat's Beard	Tragapogon dubius
Golden Dock	Rumex maritimus
Great Solomon's Seal	Polygonatum biflorum
Green Milkweed	Asclepius viridiflora
Grooved Flax	Linum sulcatum
Ground Cherry	Physalis virginiana
Hairy Bedstraw	Galium pilosum
Hairy Sunflower	Helianthus hirsutus
Heath Aster	Aster ericoides
Hedge Bindweed	Calystegia sepium
Hemp Dogbane	Apocynum cannabinum
Henbit	Lamium amplexicaule
Hymenopappus	Hymenopappus scabiosaeus
Illinois Bundleflower	Desmanthus illinoensis
Indian tobacco	Lobelia inflata
Iron Weed	Vernonia baldwinii
Jerusalem artichoke	Helianthus tuberosus
Jimsonweed	Datura stramonium
Joe-pye Weed	Eupatorium purpureum
Johnny Jump-up	Viola rafinesquii
Knotted Dodder	Cuscuta glomerata
Knotweed	Polygonum arenastrum
Korean Lespedeza	Lespedeza stipulacea
Lambsquarters	Chenopodium album
Large flowered Gaura	Gaura longiflora
Large Hop Clover	Trifolium campestre
Light Poppy Mallow	Callirhoe alcaeoides
Little-leaf Buttercup	Ranunculus abortivus
Long-beard Hawkweed	Hieracium longipilum

Common Name	Scientific Name
Lotus Milk-vetch	Astragalus lotiflorus
Louisiana Sagewort	Artemisia ludoviciana
Many-flowered Scurfpea	Psoralea tenuiflora
Maple-leaved Goosefoot	Chenopodium gigantospermum
Mare's Tail	Conyza canadensis
Marijuana	Cannabis sativa
Marsh Mallow	Malva rotundifolia
Maximilian Sunflower	Helianthus maximiliani
Meadow Violet	Viola pratincola
Mint-leaf Beebalm	Monarda citriodora
Missouri Evening Primrose	Oenothera macrocarpa
Missouri Goldenrod	Solidago missouriensis
Moth Mullien	Verbascum blattaria
Mountain Sunflower	Helianthus laetiflorus
Mouse-ear Chickweed	Cerastium vulgatum
Musk Thistle	Carduus nutans
Narrow-leaf Bluets	Houstonia nigricans
Narrowleaf Gromwell	Lithospermum incisum
Narrowleaf Milkweed	Asclepias stenophylla
Narrow-leaf Stenosyphon	Stenosiphon linifolius
Narrowleaved goosefoot	Chenopodium desiccatum
Nettleleaf Noseburn	Tragia ramosa
Nineanther Prairieclover	Dalea enneandra
Nipple Cactus	Coryphantha missouriensis
Nodding lady's tresses	Spiranthes cernua
Northern Bedstraw	Galium boreale
Nuttall Death Camas	Zigadenus nuttalli
Oldfield Cinquefoil	Potentilla simplex
Oneseed Croton	Croton monanthogynus
Pale Comandra	Commandra umbellata

Common Name	Scientific Name
Pale Dock	Rumex altissimus
Pale-seed Plantago	Plantago virginica
Panicled Tickclover	Desmodium paniculatum
Partridge Pea	Cassia fassiculata
Pennsylvania Smartweed	Polygonum pensylvanicum
Peppergrass	Lepidium densiflorum
Pitcher Sage	Salvia pitcheri
Plains Coreopsis	Coreopsis tinctoria
Plains Larkspur	Delphinium virescens
Plains Milkweed	Asclepias pumila
Plains Wild Indigo	Baptisia leucophaea
Poison Hemlock	Conium maculatum
Pokeberry, Pokeweed	Phytolacca americana
Poor Mans Pepper	Lepidium verginicum
Prairie Blue-eyed Grass	Sisyrinchium campestre
Prairie Coneflower	Ratibida columnifera
Prairie Groundsel	Senecio plattensis
Prairie Parsley	Polytaenia nuttallii
Prairie Turnip	Psoralea esculenta
Prairie Violet	Viola pedatifida
Prickly-pear Cactus	Opuntia macrorhiza
Prostrate Knotweed	Polygonum aviculare
Prostrate Spurge	Euphorbia maculata
Purple Meadow Rue	Thalictrum dasycarpum
Purple Poppy Mallow	Callirhoe involucrata
Purple Prairie Clover	Dalea purpurea
Purplestem Beggarticks	Bidens connata
Purslane Speedwell	Veronica peregrina
Rattlesnake Fern	Botrychium virginianum
Redroot Pigweed	Amaranthus retroflexus

Common Name	Scientific Name
Rough-false Pennyroyal	Hedeoma hispida
Roundhead Prairieclover	Dalea multiflora
Round-head Lespedeza	Lespedeza capitata
Rugels Plantago	Plantago rugelii
Sawtooth Sunflower	Helianthus grosseserratus
Sedges/Rushes	Carex/Rushes
Sericea Lespedeza	Lespedeza cuneata
Serrate-leaf Evening Primrose	Calylophus serrulatus
Shell-leaf Penstemon	Penstemon grandiflorus
Shepherd's Purse	Capsella bursa-pastoris
Showy Evening Primrose	Oenothera speciosa
Showy-wand Goldenrod	Solidago speciosa
Silk-top Dalea	Dalea aurea
Silky Aster	Aster sericeus
Silverleaf Nightshade	Solanum elaeagnifolium
Silver-leaf Scurfpea	Psoralea argophylla
Sleepy Catchfly	Silene antirrhina
Slender Knotweed	Polygonum tenue
Slimleaf Goosefoot	Chenopodium pallescens
Slimpod Venus’ Looking glass	Triodanus leptocarpa
Small flowered Gaura	Gaura parviflora
Small Venus' Looking glass	Triodanus biflora
Snow-on-the-mountain	Euphorbia marginata
Spanish Needles	Bidens bipinnata
Spiderwort	Tradescantia occidentalis
Spotted Geranium	Geranium maculatum
Spreading Yellowcress	Rorippa sinuata
St. John's Wort	Hypericum perforatum
Starry Campion	Silene stellata
Stick-leaf Mentzelia	Mentzelia oligosperma

Common Name	Scientific Name
Stiff Goldenrod	Solidago rigida
Stiff Sunflower	Helianthus rigidus
Stinging Nettle	Urtica dioica
Sulphur Cinquefoil	Potentilla recta
Summer Cypress	Kochia scoparia
Swamp Smartweed	Polygonum amphibium
Sweet William	Dianthus barbatus
Tall Anemone	Anemone virginiana
Tall Goldenrod	Solidago altissima
Tall Thistle	Cirsium altissimum
Tick Clover	Desmodium illinoense
Toothed Spurge	Euphorbia dentata
Tube Penstemon	Penstemon tubaeflorus
Tuberous Indianplantain	Cacalia tuberosa
Velvetleaf	Abutilon theophrasti
Venus' Looking Glass	Triodanus perfoliata
Viginia Knotweed	Polygonum virginianum
Violet Lespedeza	Lespedeza violaceae
Violet Oxalis	Oxalis violacea
Virginia Copperleaf	Acalypha virginica
Water Hemlock	Cicuta maculata
Water Willow	Justicia americana
Wavyleaf Microseris	Microseris cuspidata
Wavyleaf Thistle	Cirsium undulatum
Wedge-leaf Frog Fruit	Phyla cuneifolia
Western Marbleseed	Onosmodium molle
Western Ragweed	Ambrosia psilostachya
Western Yarrow	Achillea millefolium
White Avens	Geum canadense
White Prairie Clover	Dalea candidum

Common Name	Scientific Name
White Snakeroot	Eupatorium rugosum
White Sweetclover	Melilotus alba
White Vervain	Verbenia urticifolia
Whole-leaf Rosinweed	Silphium integrifolium
Whorled Milkweed	Asclepias verticillata
Whorled Polygala	Polygala verticillata
Wild 4 o'clock	Mirabilis nyctaginea
Wild Carrot	Daucus carota
Wild Chervill	Chaerophyllum procumbens
Wild Hyacinth	Camassia scilloides
Wild Lettuce	Lactuca canadensis
Wild Onion	Allium drummondii
Wild Senna	Cassia marilandica
Wild Strawberry	Fragaria virginiana
Winged Loosestrife	Lythrum dacotanum
Wingstem	Verbesina alternifolia
Woodland Ruellia	Ruellia strepens
Woods Bedstraw	Galium circaezans
Woolly Croton	Croton capitatus
Woolly Indianwheat	Plantago patagonica
Wooly Verbena	Verbena stricta
Yellow Oxalis	Oxalis stricta
Yellow Sweetclover	Melilotus officianalis
Yerba de Tajo	Eclipta alba
Yucca	Yucca glauca
Grasses	
American Beakgrain	Diarrhena americana
Barnyard Grass	Echinochloa crusgalli
Beard Grass	Andropogon ternarius
Bermuda Grass	Cynodon dactylon

Common Name	Scientific Name
Big Bluestem	Andropogon gerardii
Blowout Grass	Muhlenbergia pungens
Blue Grama	Bouteloua gracilis
Bottlebrush Squirreltail	Sitanion hystrix
Buffalograss	Buchloe dactyloides
Canada Bluegrass	Poa compressa
Canadian Wildrye	Elymus canadensis
Chinese Foxtail	Setaria faberi
Common Wheat	Triticum aestivum
Crabgrass	Digitaria sanguinalis
Cupgrass	Eriochloa contracta
Downey Brome	Bromus tectorum
Eastern Gammagrass	Tripsacum dactyloides
Field Sandburr	Cenchrus longispinus
Foxtail	Alopecuras myosuroides
Goosegrass	Eleusine indica
Green Bristlegrass	Setaria viridis
Hairy Grama	Bouteloua hirsuta
Indiangrass	Sorghastrum nutans
Japanese Brome	Bromus japonicus
Johnsongrass	Sorghum halepense
Kentucky Bluegrass	Poa pratensis
Leptaloma	Leptaloma cognatum
Little Barley	Hordeum pusillum
Little Bluestem	Schizachyreum scoparium
Nimblewill	Muhlenbergia schreberi
Nodding Fescue	Festuca obtusa
Orchard Grass	Dactylis glomerata
Panicgrass	Panicum anceps
Perennnial Ryegrass	Lolium perenne

Common Name	Scientific Name
Plains Muhly	Muhlenbergia cuspidata
Poverty Dropseed	Sporobolus vaginiflorus
Prairie Cordgrass	Spartina pectinata
Prairie Dropseed	Sporobolus heterolepis
Prairie Junegrass	Koeleria nitida
Prairie Three-Awn	Aristida oligantha
Purple Lovegrass	Eragrostis spectabilis
Purpletop	Tridens flavus
Red Three-Awn	Aristida longiseta
Red Top	Agrostis stolonifera
Reed Canarygrass	Phalaris aundinacea
Rice Cutgrass	Leersia oryzoides
Sand Dropseed	Sporobolus cryptandrus
Sand Lovegrass	Eragrostis trichodes
Sand paspalum	Paspalum setaceum
Scribners Panicum	Dichanthelium oligosanthes
Sideoats Grama	Bouteloua curtipendula
Silver Bluestem	Bothriochloa saccharoides
Six Weeks Fescue	Vulpia octoflora
Smooth Brome	Bromus inermis
Stinkgrass	Eragrostis cilianensis
Switchgrass	Panicum virgatum
Tall Dropseed	Sporobolus asper
Tall Fescue	Festuca arundinacea
Timothy	Phleum pratense
Tumblegrass	Schedonnardus paniculatus
Virginia Wildrye	Elymus virginicus
Wedgescale	Sphenopolis obtusata
Wilcox Panicum	Dichanthelium oligosanthes
Wild Oats	Avena fatua

Common Name	Scientific Name
Windmill Grass	Chloris verticillata
Winter Bentgrass	Agrostis hiemalis
Witchgrass	Panicum capillare
Yellow Bristlegrass	Setaria glauca
Trees	
American Elm	Ulmus americana
American Plum	Prunus americana
Basswood	Tilia americana
Bitternut Hickory	Carya cordiformis
Black Locust	Robinia pseudoacacia
Black Raspberry	Rubus occidentalis
Black Walnut	Juglans nigra
Black Willow	Salix nigra
Blackjack Oak	Quercus marilandica
Boxelder	Acer negundo
Burr Oak	Quercus macrocarpa
Catalpa	Catalpa speciosa
Chinkapin Oak	Quercus muhlenbergii
Choke Cherry	Prunus virginiana
Common Hackberry	Celtis occidentalis
Common Pear	Pyrus communis
Cottonwood	Populus deltoides
Dwarf Hackberry	Celtis tenuifolia
Eastern Hop-hornbeam	Oystra virginiana
Eastern Red Cedar	Juniperus virginiana
Green Ash	Fraxinus pennsylvanica
Honey Locust	Gleditsia triacanthos
Kentucky Coffeetree	Gymnocladus dioica
Osage Orange	Maclura pomifera
Peach-leaved Willow	Salix amygdaloides

Common Name	Scientific Name
Persimmon	Diospyros virginianum
Ponderosa Pine	Pinus ponderosa
Red Elm	Ulmus rubra
Red Hawthorn	Crataegus mollis
Red Mulberry	Morus rubra
Red Oak	Quercus borealis
Redbud	Cercis canadensis
Russian Olive	Eleagnus angustifolia
Sandbar Willow	Salix exigua
Sand Cherry	Prunus pumila
Sandhill (Chicksaw) Plum	Prunus angustifolia
Shumard's Oak	Quercus shumardii
Siberian Elm	Ulmus pumila
Silver Maple	Acer saccharinum
Sycamore	Platanus occidentalis
Tree-of-Heaven	Ailanthus altissima
Western Buckeye	Aesculus glabra
Wild Black Cherry	Prunus serotina
Wild Crabapple	Malus ioensis
Vines	
Bitter Sweet	Celastrus scandens
Buffalo Gourd	Cucurbita poetidissima
Burr Cucumber	Sicyos angulatus
Goose Berry	Ribes odoratum
Green Briar	Smilax hispida
Moonseed	Minispermum canadense
Poison Ivy	Toxicodendron radicans
Puncture Vine	Tribulus terrestris
Raccoon Grape	Ampelopsis cordata
River Bank Grape	Vitis riparia

Common Name	Scientific Name
Smoothseed Wildbean	Strophostyles leiosperma
Trailing Wildbean	Strophostyles helvola
Virginia Creeper	Parthenocissus quinquefolia
Wild Gooseberry	Ribes missouriense
Wooly Pipevine	Aristolochia tomentosa

Woody Species or Shrubs

Arkansas Wild Rose	Rosa arkansana
Bladdernut	Staphylea trifolia
Buckbrush	Symphoriocarpus orbiculatis
Buckthorn	Rhamnus lanceolata
Button Bush	Cephalanthus occidentalis
Dewberry	Rubus flagellaris
Elderberry	Sambucus canadensis
Hazelnut	Corylus americana
Highbush Blackberry	Rubus ostryifolius
Indigobush Amorpha	Amorpha fruiticosa
Leadplant	Amorpha canescens
Multiflora rose	Rosa multiflora
New Jersey Tea	Ceanothus herbaceus
Prickly Ash	Zanthoxylem americanum
Roughleaf Dogwood	Cornus drummondii
Skunk Brush	Rhus aromatic
Smooth Sumac	Rhus glabra
Tartarian Honeysuckle	Lonicera tatarica
Wahoo	Euonymus atropurpurea

APPENDIX C Lists of animals found on Fort Riley

Birds

Species	Species	Species	Species
GREBES	Ring-necked duck	Northern bobwhite	Bonaparte's gull
Pied-billed grebe	Lesser scaup	**Rails/Gallinules**	Ring-billed gull
Eared grebe	Common goldeneye	Black rail	Herring gull
PELICANS	Bufflehead	American coot	**TERNS**
White pelican	Hooded merganser	**CRANES**	Caspian tern
CORMORANTS	Common merganser	Sandhill crane	Forster's tern
Double-crested cormorant	Ruddy duck	**PLOVERS**	Least tern
HERONS, IBISES	**VULTURES**	Killdeer	Black tern
American bittern	Turkey vulture	Piping plover	**DOVES**
Great blue heron	**HAWKS AND EAGLES**	Semi-palmated plover	Rock dove
Great egret	Osprey	Snowy plover	Mourning dove
Little blue heron	Bald eagle	**SANDPIPERS, et. al**	**CUCKOOS**
Snowy egret	Golden eagle	American avocet	Black-billed cuckoo
Cattle egret	Northern harrier	Greater yellowlegs	Yellow-billed cuckoo
Green-backed heron	Sharp-shinned hawk	Lesser yellowlegs	**OWLS**
White-faced ibis	Cooper's hawk	Willet	Eastern screech owl
GEESE	Red-shouldered hawk	Hudsonian godwit	Great horned owl
Greater white-fronted goose	Broad-winged hawk	Spotted sandpiper	Burrowing owl
Snow goose	Swainson's hawk	Sanderling	Barred owl
Greater Canada goose	Red-tailed hawk	Ruddy turnstone	Short-eared owl
Lesser Canada goose	Harlan's hawk	Upland sandpiper	**GOATSUCKERS**
DUCKS	Rough-legged hawk	Semipalmated sandpiper	Common nighthawk
Wood duck	Ferruginous hawk	Western sandpiper	Common poorwill
Green-winged teal	**FALCONS**	Least sandpiper	Chuck will's widow
Mallard	American kestrel	White-rumped sandpiper	Whip-poor-will
Northern pintail	Merlin	Baird's sandpiper	**SWIFTS, HUMMINGBIRDS**
Blue-winged teal	Peregrine falcon	Pectoral sandpiper	Chimney swift
Cinnamon teal	Prairie falcon	Long-billed dowitcher	Ruby-throated hummingbird
Northern shoveler	**FOWL**	Common snipe	**KINGFISHERS**
Gadwall	Ring-necked pheasant	American woodcock	Belted kingfisher
American wigeon	Greater prairie chicken	Wilson's phalarope	**WOODPECKERS**
Canvasback	Ruffed grouse	**GULLS**	Red-headed woodpecker
Redhead	Wild turkey	Franklin's gull	Red-bellied woodpecker

Appendix C Lists of animals found on Fort Riley (con't)

Birds (con't)

Species	Species	Species
WOODPECKERS	**NUTHATCHES, CREEPERS**	**STARLINGS**
Yellow-bellied sapsucker	Red-breasted nuthatch	European starling
Downy woodpecker	White-breasted nuthatch	**VIREOS**
Hairy woodpecker	Brown creeper	White-eyed vireo
Pileated woodpecker	**WRENS**	Bell's vireo
Northern flicker	Carolina wren	Yellow-throated vireo
FLYCATCHERS	Bewick's wren	Warbling vireo
Eastern wood pewee	House wren	Red-eyed vireo
Traill's flycatcher	Winter wren	**WARBLERS**
Least flycatcher	Sedge wren	Tennessee warbler
Acadian flycatcher	**KINGLETS et al.**	Nashville warbler
Eastern phoebe	Golden-crowned kinglet	Northern parula
Great-crested flycatcher	Ruby-crowned kinglet	Yellow warbler
Western kingbird	Blue-gray gnatcatcher	Orange-crowned warbler
Eastern kingbird	**THRUSH**	Magnolia warbler
Scissor-tailed flycatcher	Eastern bluebird	Yellow-rumped warbler
LARKS	Wood thrush	Blackpoll warbler
Horned lark	Veery	Black and white warbler
SWALLOWS	Swainson's thrush	American redstart
Tree swallow	Gray-cheeked thrush	Prothonotary warbler
Northern rough-winged swallow	American robin	Ovenbird
Bank swallow	**THRASHERS**	Louisiana waterthrush
Cliff swallow	Gray catbird	Kentucky warbler
Barn swallow	Northern mockingbird	Common yellowthroat
JAYS, CROWS, MAGPIES	Brown thrasher	Wilson's warbler
Blue jay	**PIPITS**	Yellow-breasted chat
American crow	American pipit	**TANAGERS**
Black-billed magpie	**WAXWINGS**	Summer tanager
CHICKADEES, TITMOUSE	Cedar waxwing	Scarlet tanager
Black-capped chickadee	**SHRIKES**	
Tufted titmouse	Loggerhead shrike	

Appendix C Lists of animals found on Fort Riley (con't)

Birds (con't)

Species	Species
GROSBEAKS	White- crowned sparrow
Northern cardinal	Harris' sparrow
Rose breasted grosbeak	Dark-eyed junco
Blue grosbeak	**BLACKBIRDS**
BUNTINGS	Bobolink
Indigo bunting	Red-winged blackbird
Lazuli bunting	Eastern meadowlark
Dickcissel	Western meadowlark
SPARROWS	Yellow-headed blackbird
Rufous-sided towhee	Rusty blackbird
Spotted towhee	Common grackle
American tree sparrow	Brown-headed cowbird
Chipping sparrow	Orchard oriole
Field sparrow	Baltimore oriole
Swamp sparrow	**FINCHES**
Vesper sparrow	Purple finch
Lark sparrow	House finch
Clay-colored sparrow	Pine Siskin
Savannah sparrow	American goldfinch
Grasshopper sparrow	House sparrow
Henslow's sparrow	
LeConte's sparrow	**223 species**
Fox sparrow	
Song sparrow	
Lincoln's sparrow	
White- throated sparrow	

Appendix C Lists of animals found on Fort Riley (con't)

Mammals

- western harvest mouse
- deer mouse
- white-footed mouse
- house mouse
- hispid pocket mouse
- plains harvest mouse
- prairie vole
- southern bog lemming
- eastern woodrat
- eastern mole
- big brown bat
- little brown bat
- woodchuck
- red bat
- eastern pipistrelle bat
- hoary bat
- thirteen-lined ground squirrel
- plains pocket gopher
- Elliot's short-tailed shrew
- least shrew
- hispid cotton rat
- porcupine
- nine-banded armadillo
- white-tailed deer
- mule deer
- elk (wapiti)
- turkey
- fox squirrel
- gray squirrel
- eastern cottontail rabbit
- black-tailed jack rabbit

Appendix C Lists of animals found on Fort Riley (con't)

Mammals (con't)

- badger
- bobcat
- mink
- long-tailed weasel
- muskrat
- beaver
- opossum
- raccoon
- red fox
- gray fox
- striped skunk
- coyote

Appendix C Lists of animals found on Fort Riley (con't)

Fish

shovelnose sturgeon
longnose gar
shortnose gar
American eel
gizzard shad
goldeye
rainbow trout
common carp
golden shiner
creek chub
southern redbelly dace
silver chub
speckled chub
suckermouth minnow
emerald shiner
rosyface shiner
redfin shiner
common shiner
red shiner
Topeka shiner
sand shiner
plains minnow
fathead minnow
bullhead minnow
bluntnose minnow
central stoneroller
blue sucker
bigmouth buffalo
smallmouth buffalo (*Ictiobus bubalus*)
river carpsucker
shorthead redhorse
white sucker
black bullhead
yellow bullhead

Appendix C Lists of animals found on Fort Riley (con't)

channel catfish
flathead catfish
slender madtom
stonecat
blackstripe topminnow
mosquitofish
white bass
smallmouth bass
spotted bass
largemouth bass
green sunfish
redear sunfish
bluegill
orangespotted sunfish
longear sunfish
white crappie
black crappie
walleye
logperch
Johnny darter
orangethroat darter
freshwater drum

Appendix C Lists of animals found on Fort Riley (con't)

Reptiles and Amphibians

Turtles:

- Common Snapping Turtle
- Painted Turtle
- Ouachita Map Turtle
- Ornate Box Turtle
- Slider
- Smooth Softshell
- Spiny Softshell

Lizards:

- Eastern Collared Lizard
- Texas Horned Lizard
- Great Plains Skink
- Ground Skink
- Six-lined Racerunner
- Western Slender Glass Lizard

Snakes:

- Ringneck Snake
- Western Hognose Snake
- Eastern Hognose Snake
- Flathead Snake
- Plains Blackhead Snake
- Racer
- Black Rat Snake
- Great Plains Rat Snake
- Prairie Kingsnake
- Speckled Kingsnake
- Milk Snake
- Gopher Snake
- Northern Water Snake
- Brown Snake
- Western Ribbon Snake

- Common Garter Snake
- Lined Snake
- Copperhead

Amphibians:

- Salamanders:
  - Tiger Salamander
- Frogs and Toads:
  - Plain Spadefoot
  - American Toad
  - Woodhouse's Toad
  - Northern Cricket Frog
  - Cope's Gray Treefrog
  - Western Chorus Frog
  - Plains Leopard Frog
  - Bullfrog
  - Great Plains Narrowmouth Toad